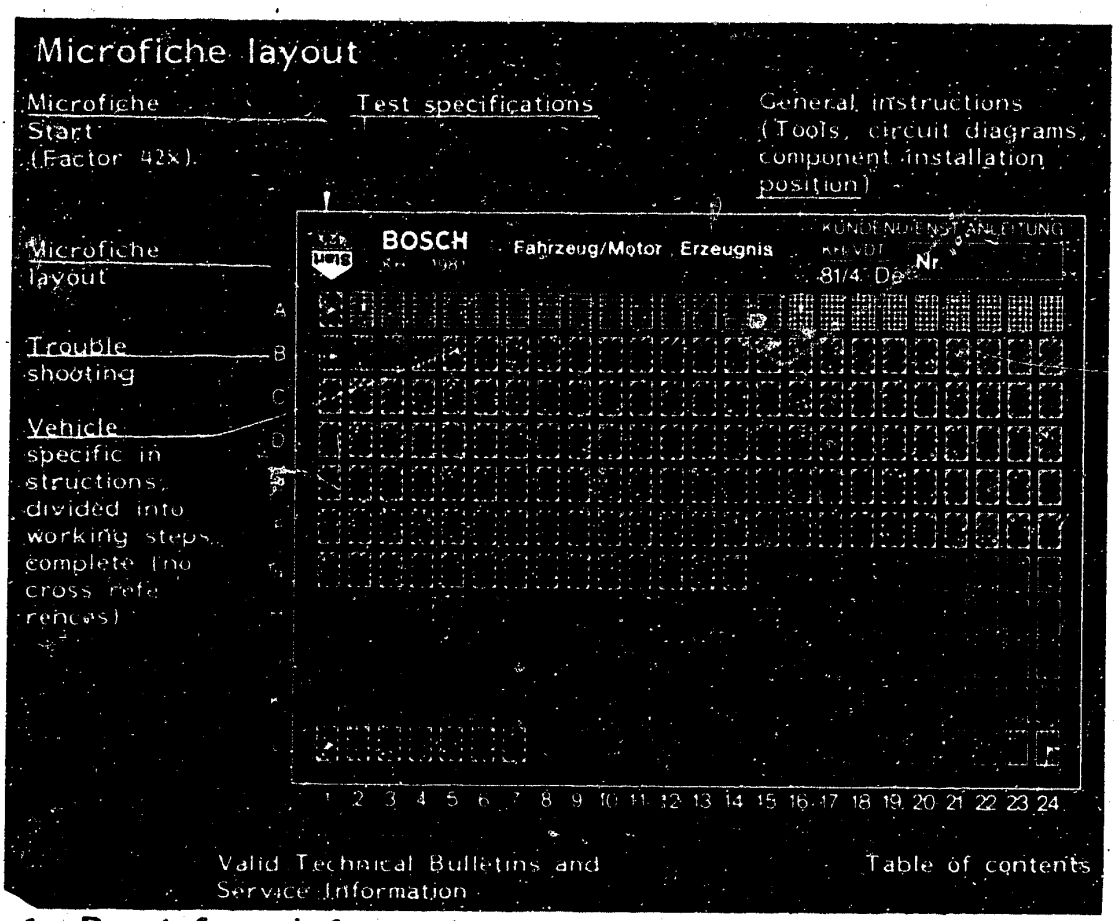
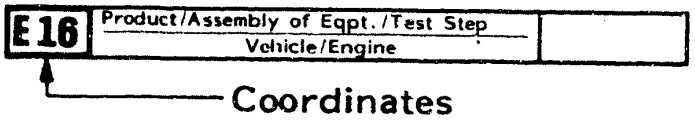
Microfiche layout



1. Read from left to right

2. Microimage title (appears on each Microimage)



3. Section limits.

Start | Intermediate section | End | 1-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

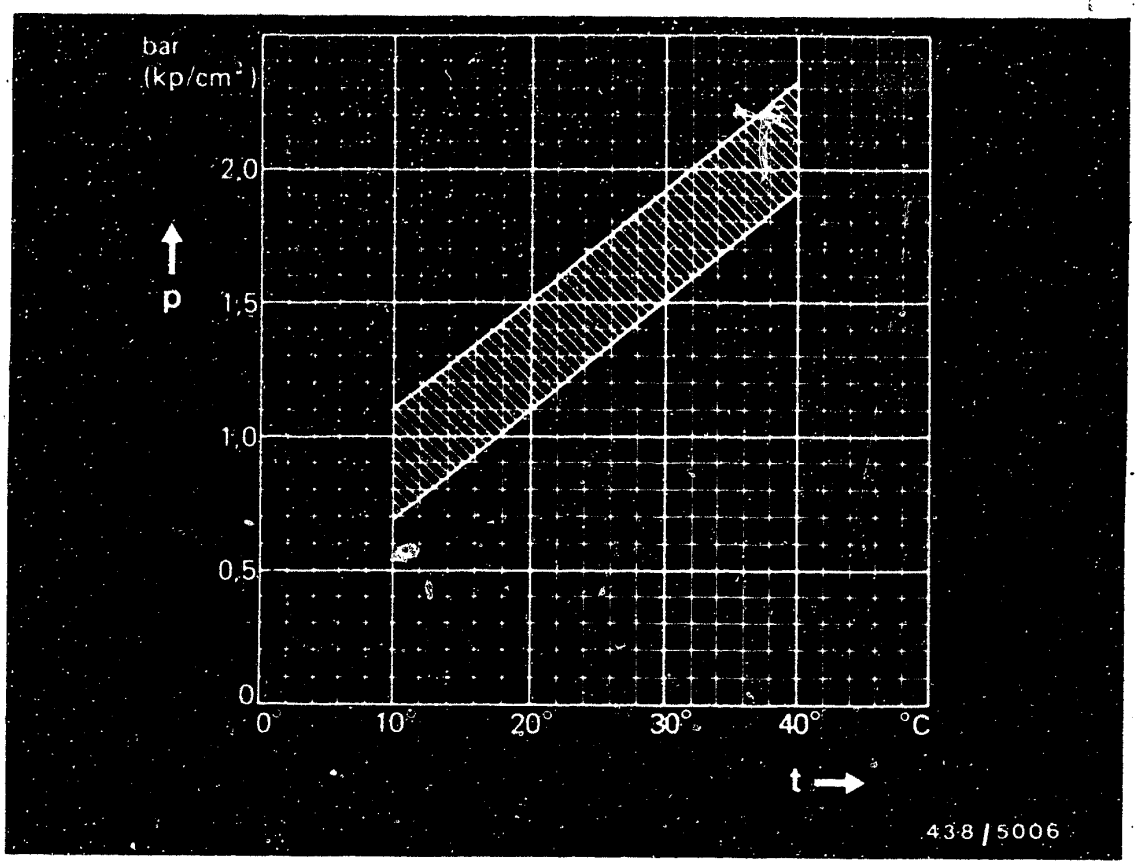
C6

1. Test specifications

1.1 Electric fuel pump

C7

Test step	Test specifications
Fuel delivery:	min. 930 cm^3/30 s



p — Control pressure (gauge pressure)
t — Ambient temperature

1.2 Control pressure "cold"

C21

Part No. of warm-up regulator: 0 438 140 057
(Model for full-load enrichment)

In order to carry out the test, connect vaccum pump to the intake-manifold connection of the warm-up regulator.

Setting value: 510 ... 550 mbar
(385 ... 415 Torr)

1.3 Control pressure "warm"

1.3.1 Warm-up regulator 0 438 140 057 (Model for full-load enrichment)

Test step	Test specifications
Test at atmospheric pressure (without vacuum)	2.8 ... 3.2 bar (2.9 ... 3.3 kgf/cm² gauge pressure
For testing purposes, connect vacuum pump to the intake-manifold connection of the warm-up regulator Setting value: 510...550 mbar (385...415 Torr)	3.4 ... 3.8 bar (3.5 ... 3.9 kgf/cm²) gauge pressure

1.4 Primary pressure

D5

Fuel-dist. No.	Test specification*	Setting value*
0 438 100 040 0 438 100 069 0 438 100 085 0 438 100 099 0 438 100 106	4.7...5.4 bar (4.8...5.5 kgf/cm²)	4.9...5.1 bar (5.0...5.2 kgf/cm²)
0 438 100 011	5.0...5.6 bar (5.1...5.7 kgf/cm²)	5.2...5.4 bar (5.3...5.5 kgf/cm²)

D13

1.5 Leak test

Test step	Test specification
Minimum pressure after 10 mins after 20 mins	 2.7 bar (2.8 kgf/cm²) 2.6 bar (2.7 kgf/cm²)

Pressures in the test specifications table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure)

E13

1.6 Injection valves

Opening pressure: 3.0 ... 4.1 bar (3.1 ... 4.2 kgf/cm²)

F13

1.7 Idle-speed adjustment

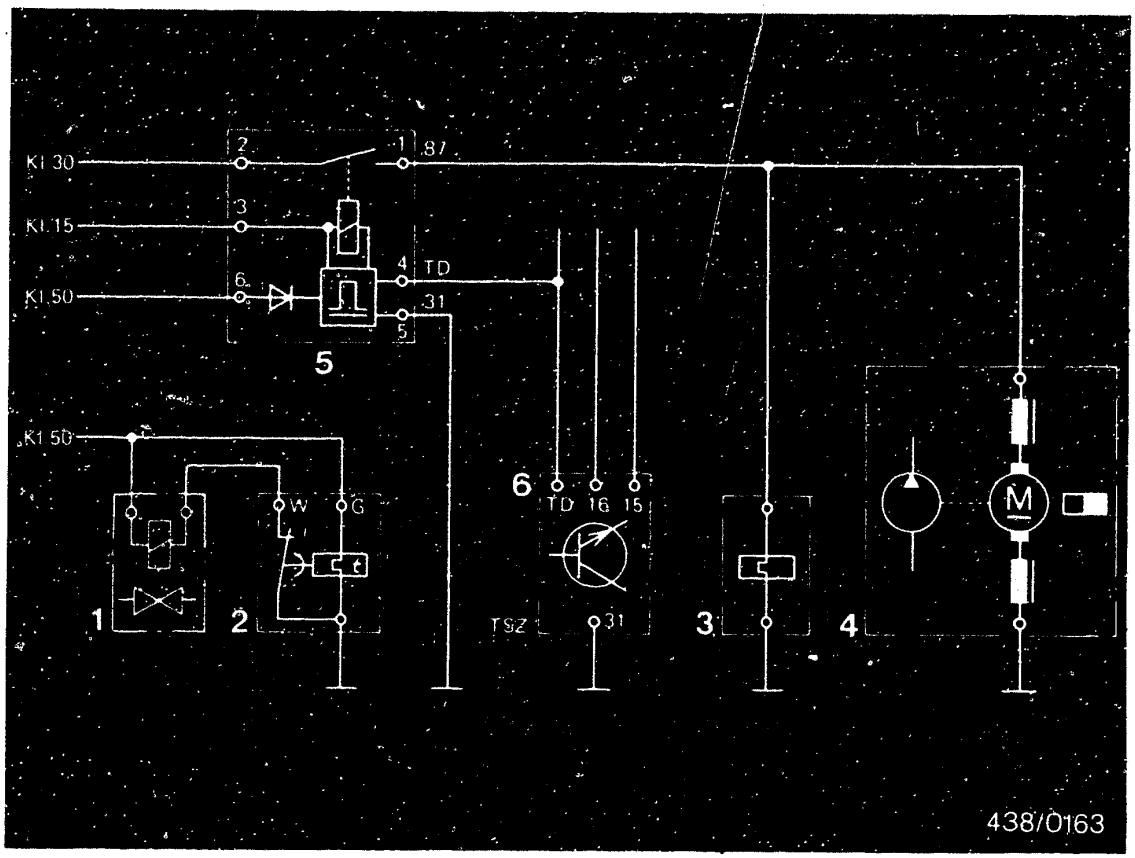
Idle speed:
2.8 l engine - Europe: 750 ... 850 min^{-1}
CO-content:
2.8 l engine - Europe: 0.5 ... 1.5 Vol%

F1

1.8 Fuel distributor

Comparitive measurement of delivered quantities	Setting point	Max. permitted delivered qty.
Idle	6.0 cm³/min	6.6 cm³/min
Part load	30.0 cm³/min	34.0 cm³/min
Full load	100.0 cm³/min	110.0 cm³/min

Pressures in the test-specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).



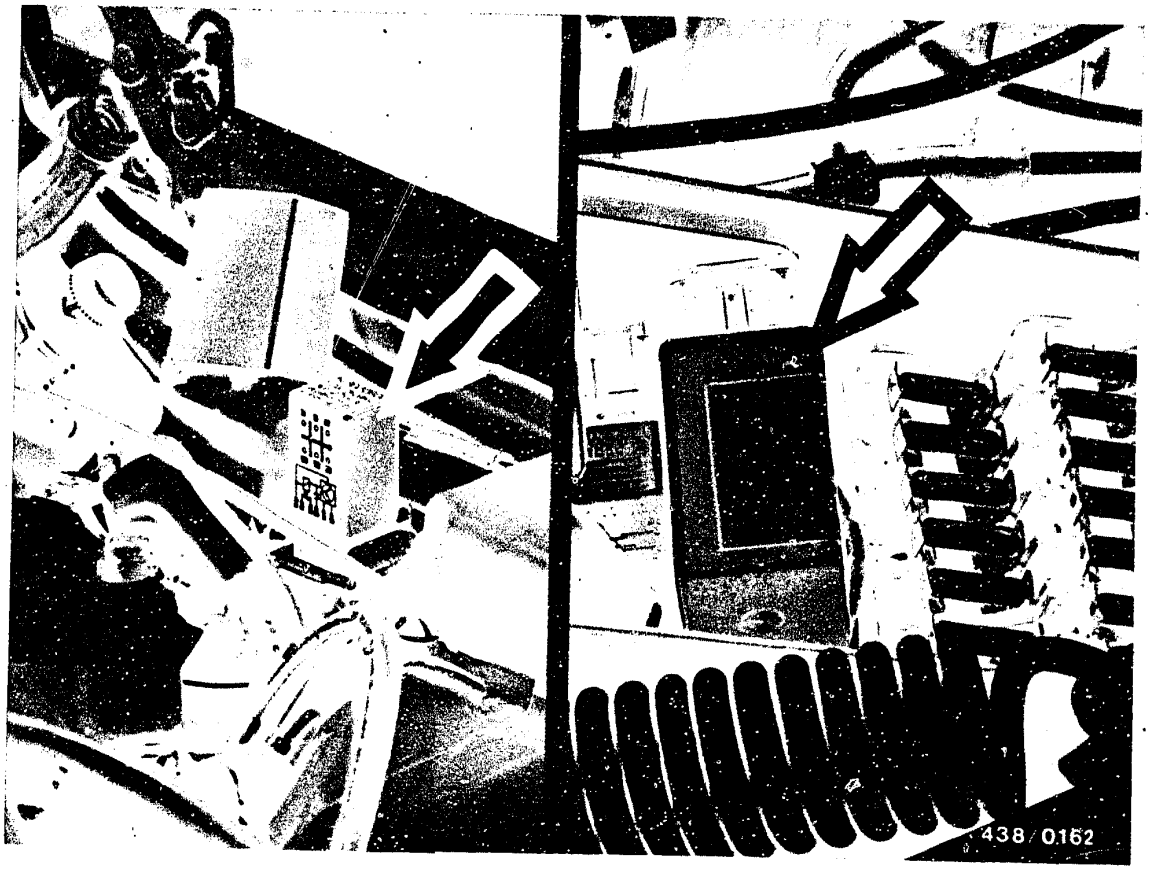
1 = Start valve
2 = Thermo-time switch
3 = Warm-up regulator
4 = Electric fuel pump
5 = Electronic relay
6 = Trigger box for transistorized ignition system (TCI)

KL = Terminal
TSZ = TCI

2. Electrical safety circuit

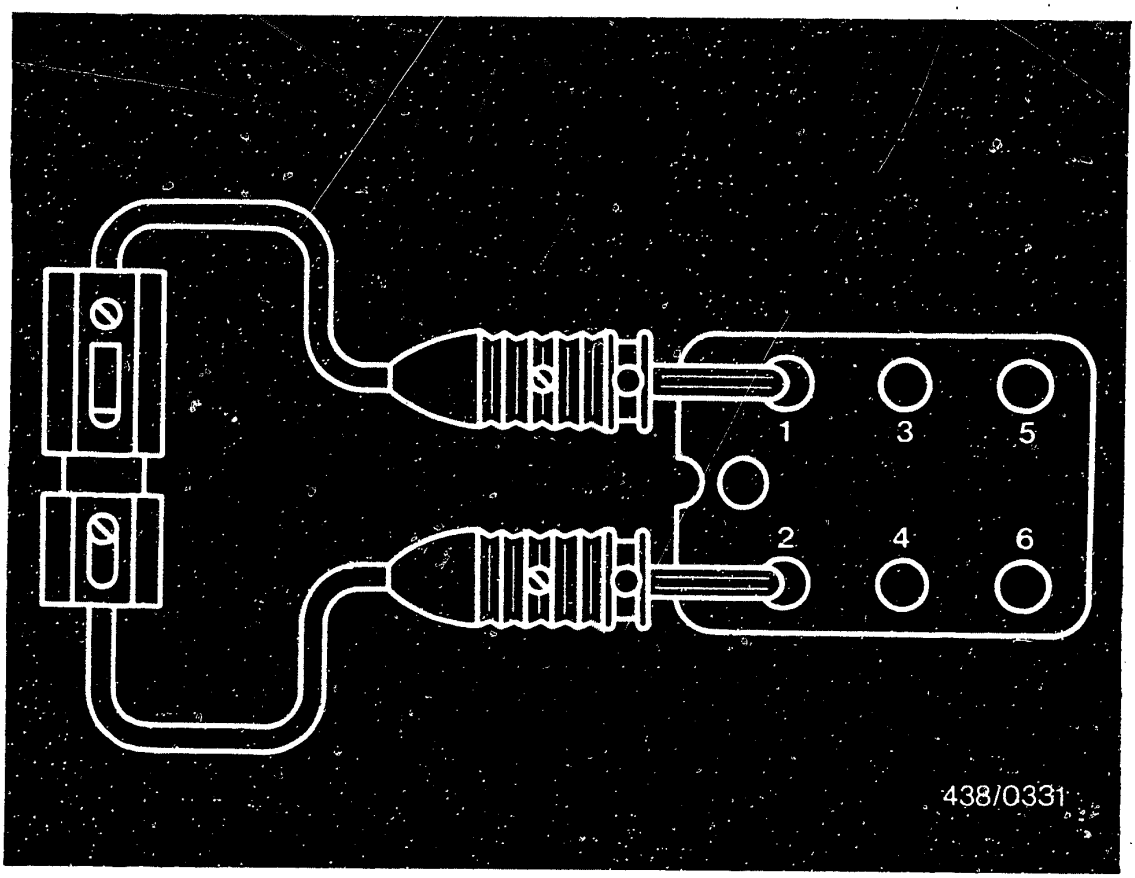
The safety circuit employs an electronic relay which is triggered from terminal TD of the trigger box of the transistorized ignition system.

Additional function of the relay: Protection against overrevving
At an engine speed of 6650 min^{-1} the electric fuel pump is switched off in order to limit the engine speed.

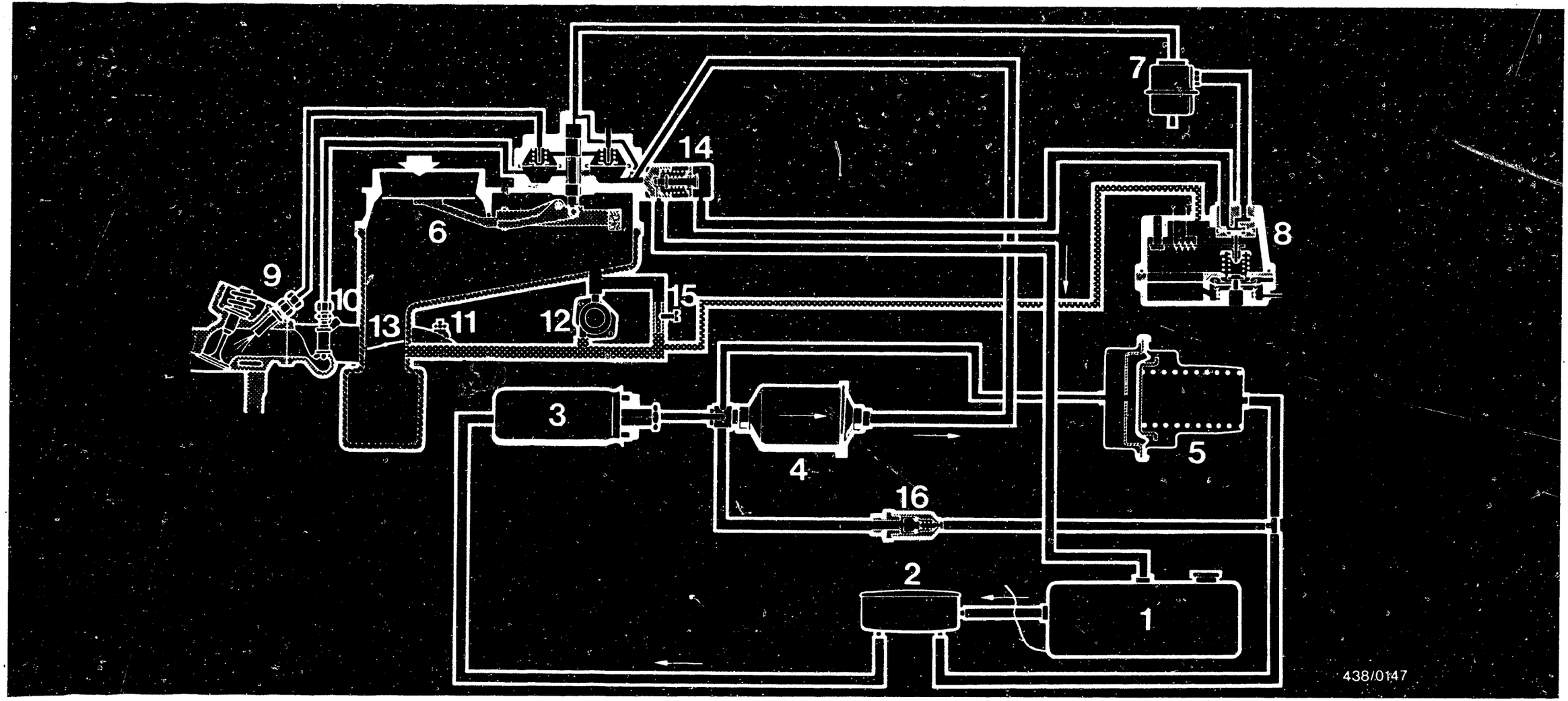


2.1 Bridging the safety circuit

In order to carry out testing with the engine stationary, it is necessary to bridge the safety circuit.
To do this, pull the electronic relay out of its base. The electronic relay (arrow) is positioned on the left-hand side in front of the firewall in the engine compartment.



Connect sockets 1 (87) and 2 (30) in the base.
Use connecting cable 1.5 mm² with fuse holder and 16 A fuse (to be user-fabricated according to sketch).
Electric fuel pump, warm-up regulator and auxiliary-air device are now supplied with battery voltage.



3. Diagram of fuel lines

1 = Fuel tank
2 = Intake-noise damper
3 = Electric fuel pump
4 = Fuel filter
5 = Fuel accumulator
6 = Mixture-control unit with downdraft air-flow sensor
7 = Fuel-line-pressure damper
8 = Warm-up regulator
9 = Injection valve
10 = Start valve
11 = Thermo-time switch
12 = Auxiliary-air device
13 = Throttle valve
14 = Primary-pressure regulator with push valve
15 = Idle-speed-adjusting screw (bypass)
16 = Pressure-relief valve

= Intake-manifold-pressure lines
= Fuel lines

4. General information

4.1 Introduction

As from the 1980 model the following vehicles are supplied with the 2.8 l/6-cylinder engine with K-Jetronic:

Vehicles:	Type:
280 E, CE, TE	123..
280 GE	460..
280 SE, SEL	116..
280 SE, SEL	126.. as from 1980
280 SL, SLC	107..

This repair manual refers only to the above-mentioned vehicles and gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.

All the system components are dealt with in separate working steps with the corresponding test specifications.

In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.

The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation. In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

4.2 Design

The entire system of the K-Jetronic in these vehicle types corresponds, with the exception of the differences listed below, to the basic design.

4.3 Differences:

- Air-flow sensor in downdraft design.
- Fuel distributor with adjustable differential-pressure valves. In this type of fuel distributor, screw plugs are situated adjacent to the fittings for the fuel-injection lines. This applies as from the 1980 model.

This possibility for adjustment has only been introduced for production at the works. This does not result in any additional adjustment possibilities for the After-Sales Service Organization.

For this reason, the fuel distributor is to be dealt with in precisely the same manner as the conventional model. The screw plugs must not be removed or loosened.

- As from the 1980 model, a separate pressure-relief valve is fitted between the fuel-accumulator spring-chamber line and the inlet to the fuel filter

At below 0.3 bar gauge pressure in the fuel system this valve opens into the return, as a result of which the gauge pressure drops to 0 bar.
In this way, the control plunger in the fuel distributor is prevented from being possibly sucked upwards as the engine cools down.
In addition, a helical compression spring is fitted above the control plunger.

As from the 1981 model, the pressure-relief valve is integrated in the fuel distributor (at the control-pressure "tower").

- Fuel-line-pressure damper in the control-pressure line between the fuel distributor and the warm-up regulator.

- Warm-up regulator for intake-manifold-pressure dependent full-load enrichment.

- Auxiliary air device with expansion element to which the coolant is applied.

- Intake-noise damper in the fuel intake line (in order to prevent intake noises) between the fuel tank and the electric fuel pump (not a Bosch product).

- Electric fuel pump with replaceable non-return valve.

- Fuel accumulator with doubled storage volume (40 cm^3) and only one connection on accumulator end.
  The spring chamber is not vented to atmosphere but instead is connected to the fuel intake line by means of a hose leading to the intake-noise damper.

- Electrical safety circuit for the electric fuel pump and the warm-up regulator by means of an electronic relay.
  Due to this safety circuit, the components are not supplied with power until the engine is actually being started. This means that the fuel pump cannot operate and the warm-up regulator cannot shut off prematurely

- Engine-speed limitation (protection against over-revving):

  All models are fitted with automatic engine-speed limitation. The elctronic speed relay of the safety circuit switches off the electric fuel pump at an engine speed of 6650 min^{-1}. Due to the cut-off of the fuel supply, the concentration of unburnt fuel in the exhaust system - and the resulting adverse effect upon its operation - is reduced.

5. Test equipment and tools

5.1 Pressure tester KDJE-P100 (previously KDEP 1034)

For testing all fuel pressures and testing for leaks.

5.2 Connecting-parts set KDJE-P100/11 (previously DKEP 1034/11)

For connecting pressure tester KDJE-P100 (previously KDEP 1034) to the control-pressure port of the fuel distributor.

5.3 Adjusting wrench KDEP 1035

For adjusting the idle-mixture-adjusting screw in the mixture-control unit (idle-speed/CO adjustment).

5.4 Guide ring KDEP 1040/10 (dia. 85 mm)

For centering the air-flow sensor plate in the air-flow sensor.

5.5 Tester for delivered quantity comparison KDJE-P200 (previously KDJE 7451)

For comparing the fuel delivered from the individual fuel-distributor outlets.

5.6 Line set KDJE-P200/25 (previously KDJE 7451/25)

For connecting the tester for delivered quantity comparison to the K-Jetronic system with steel fuel-injection tubing.

5.7 Graduate (commercially available, capacity approx. 1.5 l)

For measuring the delivery of the electric fuel pump.

5.8 Valve tester KDJE-P400 (previously KDJE 7452).

For testing the injection valves.

Test media: Calibrating fluid (Shell K30, Esso-Varsol, Shell Mineral Spirits 135).
or
Bosch Part No. 5 973 340 650
VS 14 942-CH
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.

5.9 Tachometer (commercially available)

For idle-speed adjustment.

5.10 CO meter (commercially available)

For idle-speed CO adjustment.

5.11 Setting device KDJE 7456

For deflecting the air-flow sensor plate (downdraft air-flow sensor) when comparing the fuel deliveries from the fuel-distributor outlets.

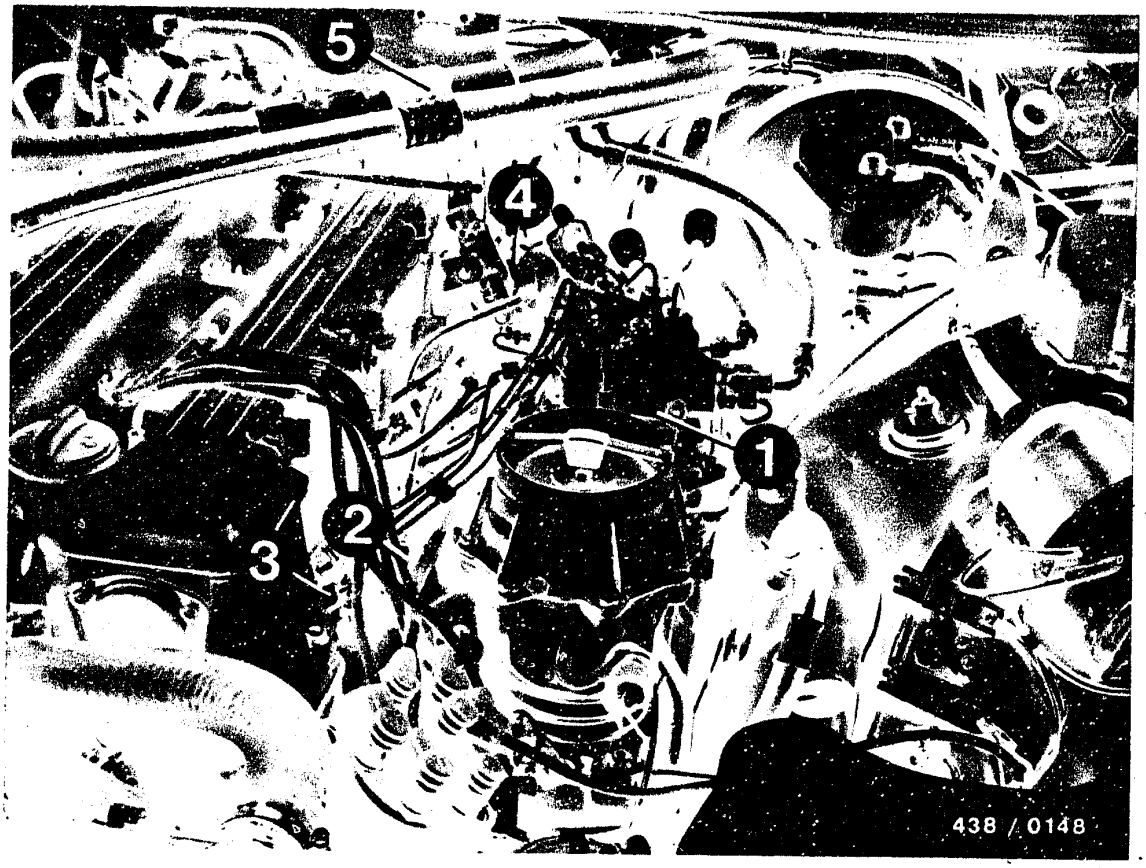
5.12 TORX offset wrench Size TX 730 (commercially available)

For screwing out the screw plug of the pressure-relief valve on the fuel distributor.

5.13 Tool set for removing and fitting the idle-speed anti-tamper device. (E.g. No. 4521/7 from Hazet Co., 5630 Remscheid).

5.14 Vacuum pump (commercially available)

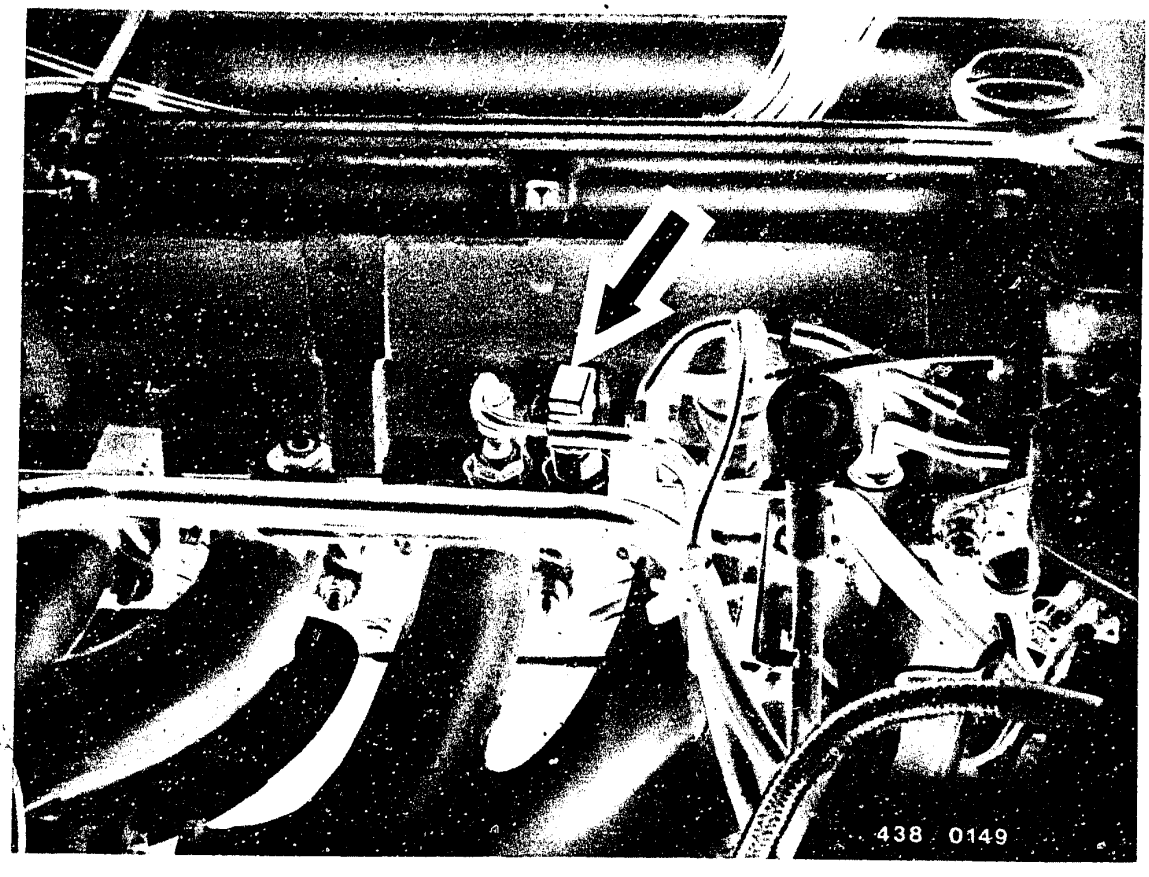
For testing warm-up regulators with manifold-pressure-dependent full-load enrichment.
For instance, hand-operated vacuum pump "Mityvac" from
Korinth Co.
Ludwig-Kloos-Straße 21
D-6450 Hanau 7 (Steinheim)



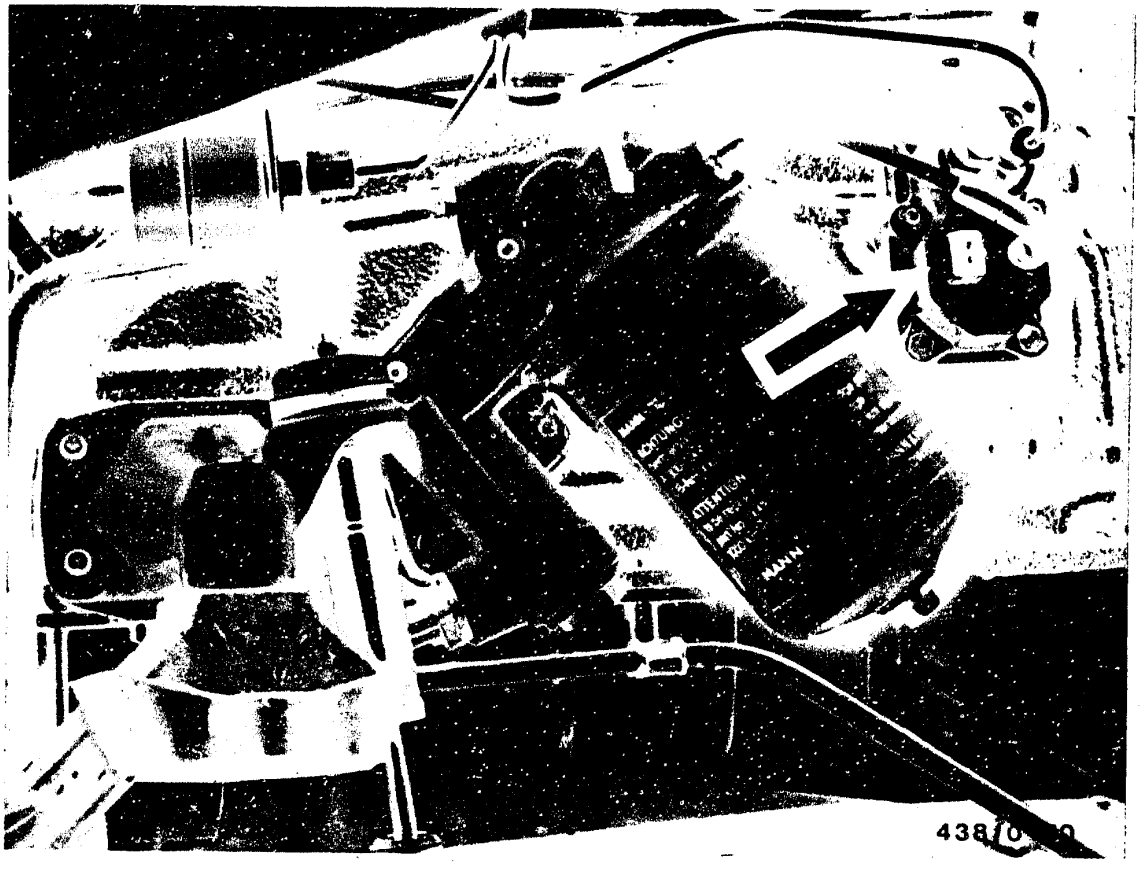
1 = Mixture-control unit
2 = Start valve
3 = Injection valves
4 = Fuel-line-pressure damper
5 = Fuel cooler

6. Installation position of individual components

6.1 Arrangement of components on the engine (Air filter removed)

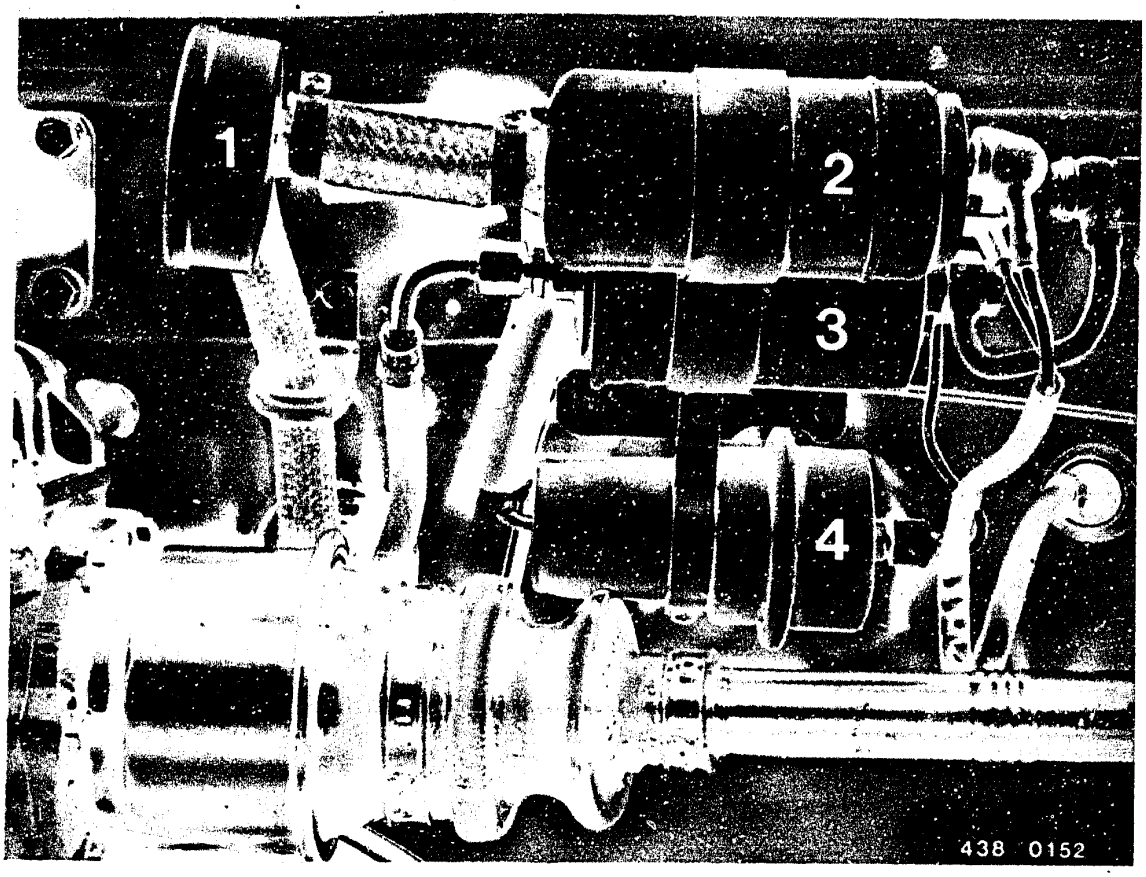


Arrow = Thermo-time switch



The warm-up regulator (arrow) is positioned on the left-hand side of the engine block.

The auxiliary-air device (arrow), to which coolant is applied, is fastened to the left-hand side of the engine block and is connected by hoses to the air duct and the throttle-valve assembly in such a manner that it can act as a bypass around the throttle valve.



1 = Intake-noise damper
2 = Electric fuel pump
3 = Fuel filter
4 = Fuel accumulator

6.2 Fuel-supply components

Intake-noise damper (1), electric fuel pump (2), fuel filter (3) amd fuel accumulator (4) are fastened to a support piece underneath the vehicle on the right-hand side above the rear axle.

The pressure-relief valve is located between the fuel filter and the fuel accumulator (concealed in the Figure).

These components are protected against road dirt by a dirt deflector (removed in the picture).

The connections of these components should be thoroughly cleaned before opening.

7. Troubleshooting chart

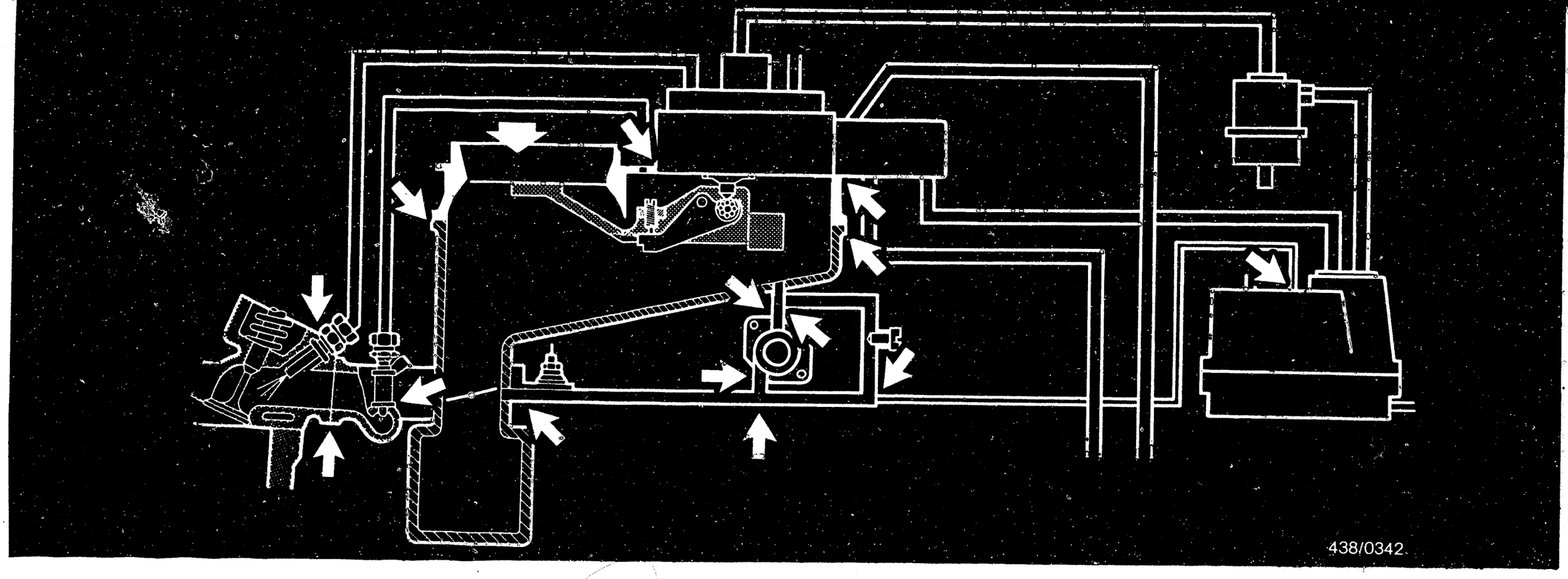
Symptom

1. Engine does not start, or starts poorly, when cold
2. Engine does not start, or starts poorly, when warm *
3. Irregular idle during warm-up phase (shakes)
4. Irregular idle with warm engine (shakes)
5. Engine does not draw gas, burbles
6. Engine misfires during driving under high load
7. Insufficient power

*Note
If, in the case of Symptom 2, after checking and repairing all the fault causes listed below, the hot-start characteristic is still unsatisfactory this can be improved by fitting an impulse relay.
The fitting of this relay is described in Coordinate L 3/L 5

1	2	3	4	5	6	7	Cause	Coordinates
	●	●	●	●		●	Vacuum system leaking	B 5
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 7
	●						Position of the air-flow sensor plate incorrect	C 1
●		●					Auxiliary air device does not open	C 6
							Electric fuel pump not operating	C 6
●	●				●		Cold-start system defective	C 7
●							Cold-start valve leaking	C 10
		●	●				Quantity of fuel delivered for control-pressure circuit is excessive	C 12
●		●					"Cold" control pressure outside tolerance	C 14
	●		●	●	●	●	"Warm" control pressure too high (after warm-up)	D 3
			●	●		●	"Warm" control pressure too low (after warm-up)	D 4
					●	●	Primary system pressure outside tolerance	D 5
	●						Overall fuel system leaking	D 13
●	●	●	●		●		Injection valves leaking, opening pressure too low	E 13
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	F 1
●	●	●	●	●			Basic idle adjustment incorrect	F 13
						●	Throttle plate does not open completely	F 13

Symptom								Coordinates
8. Engine runs on after being switched off ("diesels")	9. Fuel consumption too high	10. Flat spor during acceleration	11. CO concentration at idle too high	12. CO concentration at idle too low	13. Idle speed cannot be adjusted (too high)	14. Engine starts but then stops immediately	Cause	
		●		●			Vacuum system leaking	B 5
●		●	●	●			Air-flow sensor lever and/or control plunger not moving smoothly	B 7
●							Position of the air-flow sensor plate incorrect	C 1
							Auxiliary air device does not open	C 6
					●		Auxiliary air device does not close	C 6
						●	Electric fuel pump not operating	C 7
							Cold-start systen defective	C 10
●	●		●				Cold-start valve leaking	C 12
							Quantity of fuel delivered for control-pressure circuit is excessive	C 14
		●				●	"Warm" control pressure too high (after warm-up)	D 3
	●	●	●			●	"Warm" control pressure too low (after warm-up)	D 4
		●				●	Primary system pressure outside tolerance	D 5
							Overall fuel system leaking	D 13
●							Injection valves leaking, opening pressure too low	E 13
		●					Unequal fuel delivery (imbalance of fuel delivery)	F 1
●	●	●	●	●			Basic idle adjustment incorrect	F 13
							Throttle plate does not open completely	F 13



Working steps

8. Check the vacuum system (air-intake system) of the engine for leaks.

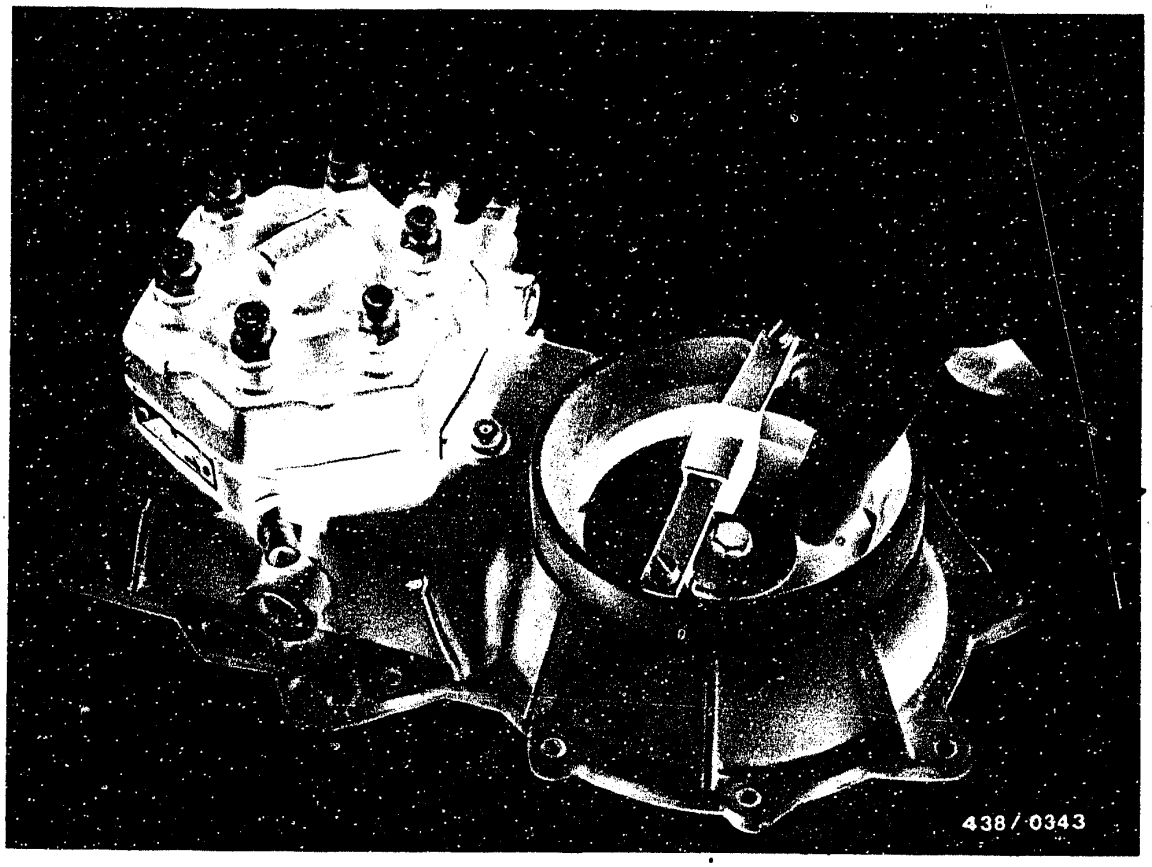
The arrows in the diagram show typical points where leaks can occur.
Check by performing a visual inspection or, in cases of doubt, as follows:

Disconnect the hose from the outlet of the auxiliary-air device and blow air through this hose into the intake system using a compressed-air gun. The throttle valve is to be fully open. Brush connection points with soapy water, or spray with leak detector (e.g. Güpoflex).

Under no circumstances may combustible liquids be used when testing for leaks.

The formation of bubbles or foam indicates a leak.
If a leak has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature:

Idle-speed adjustment is described on Coordinates F13-F19.



9. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement.

9.1 Preparations

- Engine temperature not below +20°C.
- Remove the air filter so that the air-flow sensor plate becomes accessible.
- Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

9.2 Check that the control lever moves freely

Depress the air-flow sensor plate by hand (downdraft) and release again.

The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop.

If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem.

Tighten the screws uniformly cross-wise to a torque of 9...10 Nm (0.9..1.0 kgfm).

If the housing is not deformed, then the air-flow sensor must be repaired or replaced.

If the housing is deformed, then the gasket between the mixture-control unit and the air-duct is to be removed and replaced by sealant Curil K2 or Hylomar (Bosch Part Number 5 927 350 002).

Assembly:
Remove the mixture-control unit.
Remove the gasket between the mixture-control unit and the air duct.
Clean the sealing surfaces of the mixture-control unit and the air duct.
Apply Sealant Curil K2 or Hylomar the the air-duct sealing surface.
Place the mixture-control unit on the air duct and tighten the screws uniformly, and crosswise, to a torque of 9 ... 10 Nm (0.9 ... 1.0 kgfm).

Check the sealing surface of the mixture-control unit for leaks as follows:
Pull off the hose from the inlet to the auxiliary-air device and, using a compressed-air pistol, force air into the intake system through this hose. Whilst doing so, open the throttle valve fully. Brush soapy water onto the joints, or spray with leak detector spray (i.e. Güpoflex).

Under no circumstances are inflammable liquids to be used for the leak test!

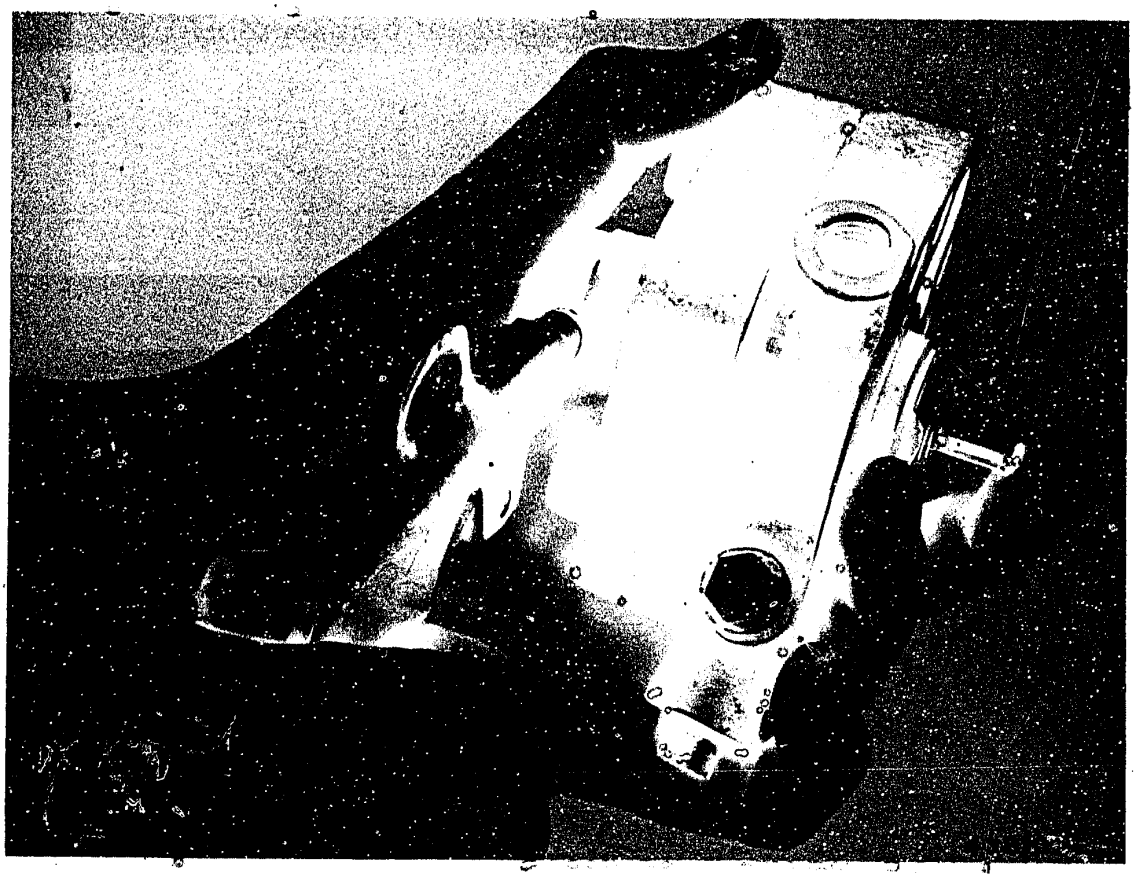
The formation of bubbles or foam indicates the location of a leak.
Let the engine run.
Check all fuel connections for leaks.

If leaks are detected, remove them.

Finally, the idle-speed adjustment is to be carried out with the engine at its normal operating temperature.

Idle-speed adjustment is described at the coordinates F13-F19.

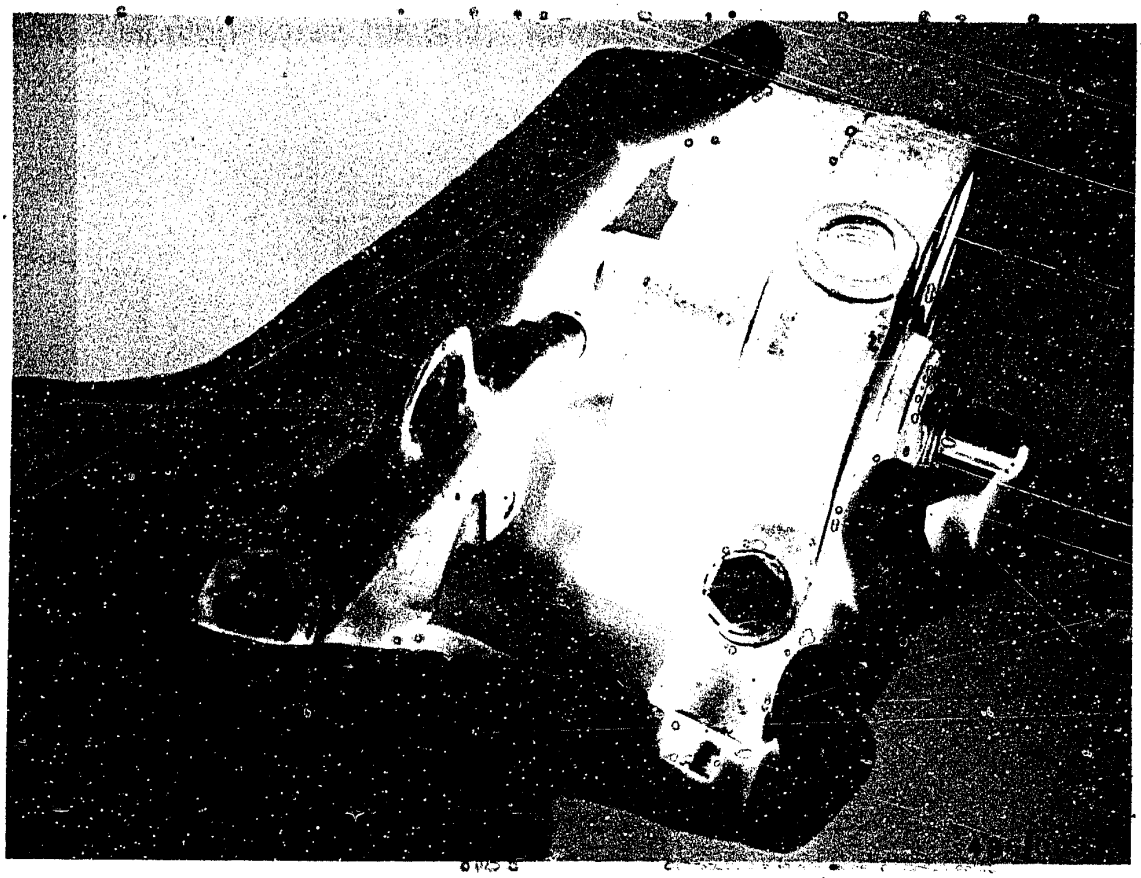
If the housing is not deformed, the air-flow sensor is to be repaired or replaced.



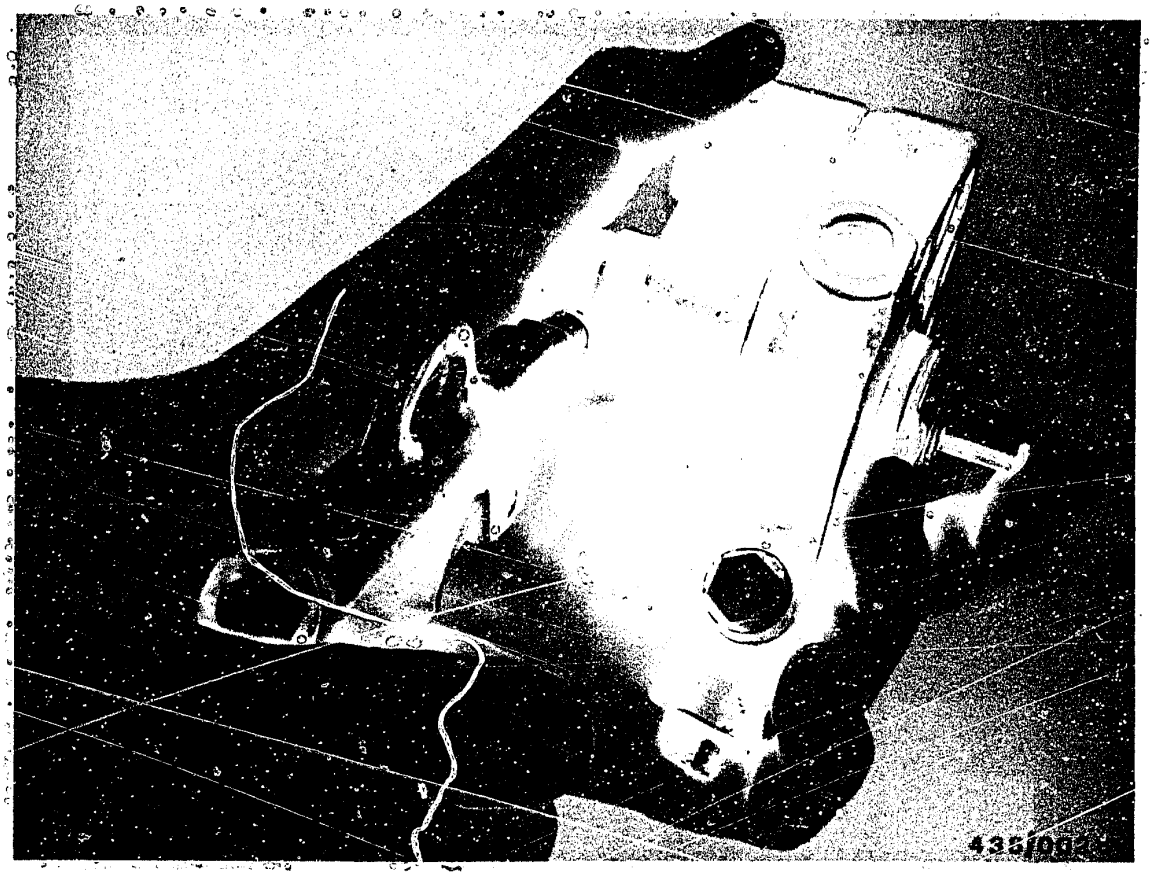
9.3 Check that the control plunger moves freely

Depress the air-flow sensor plate by hand (downdraft). The same resistance must be felt over the entire movement.

Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows this rapid movement of the sensor plate only sluggishly, and therefore initially loses contact with the sensor plate lever. It must be possible, however, to feel the plunger make contact with this lever again. If this condition is fulfilled, the control plunger can be considered to move freely. If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.



Important!
Note the following when installing fuel components and fuel lines:
Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.
When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.
Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.

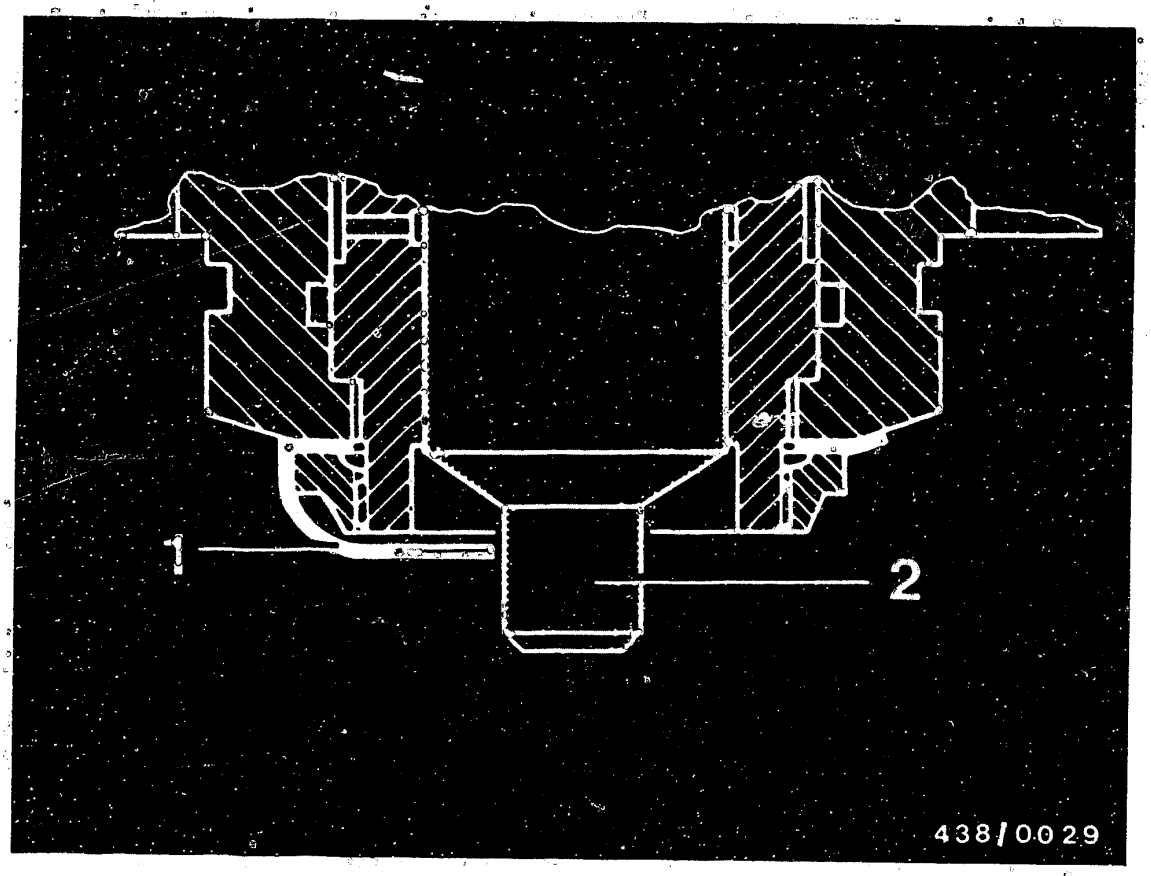


Screw out the three fastening screws and remove the fuel distributor from the air-flow sensor.

Do not bend the steel tubing lines whilst doing so!

Remove the plunger. Under certain conditions, in order to do this it may be necessary to blow compressed air briefly against the plunger through the control-pressure connection hole. Hold the plunger with your hand while doing this. Clean the plunger thoroughly with benzine. If the plunger still does not move freely, replace the fuel distributor.

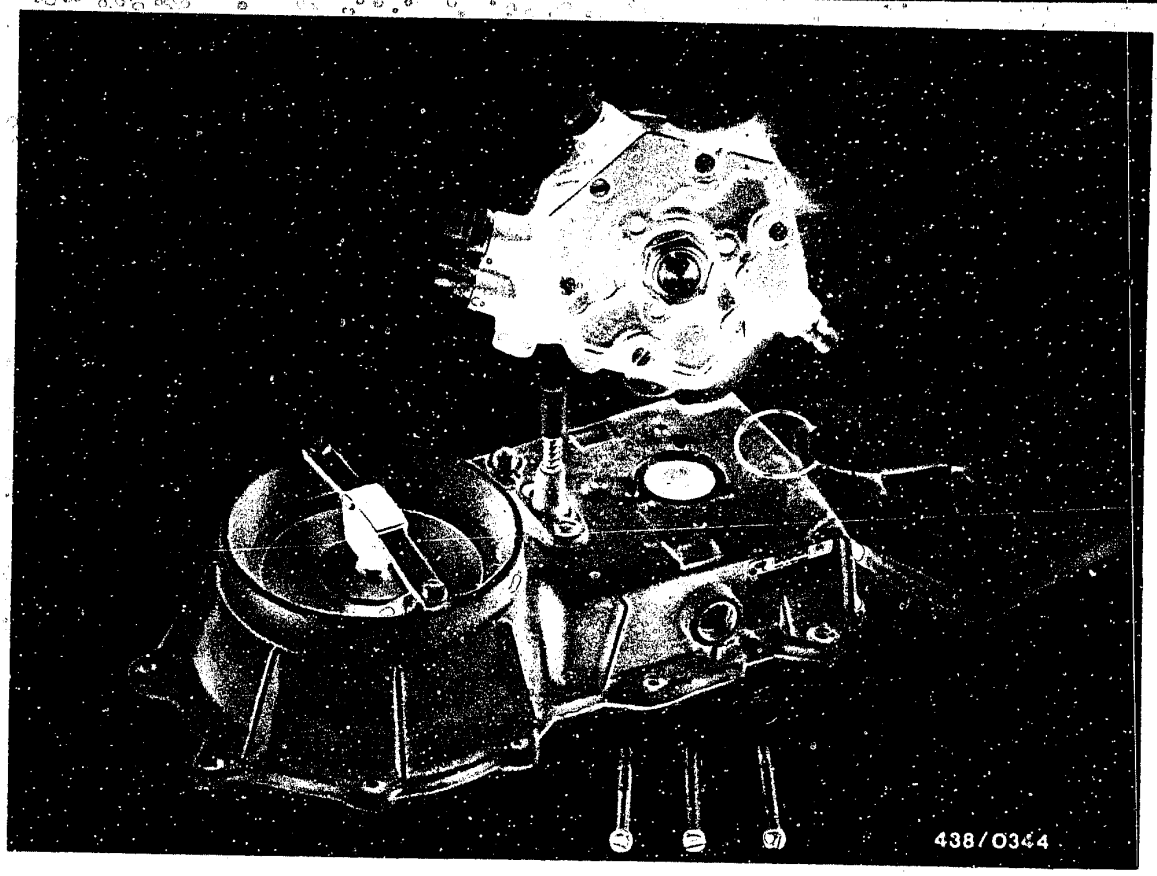
Caution:
Fuel distributors with an integral pressure-relief valve are additionally equipped with a helical compression spring above the control plunger.(as from model 1980). Pay attention to the compression spring when removing the control plunger and remember to fit it again when re-assembling.



1 = Anti-drop-out device
2 = Control plunger

9.4 Fuel distributor with anti-drop-out device for the control plunger

Caution!
The fuel distributors have an anti-drop-out device for the control plunger.
This also protects the plunger in transit and facilitates installation.
The anti-drop-out device must not be removed!

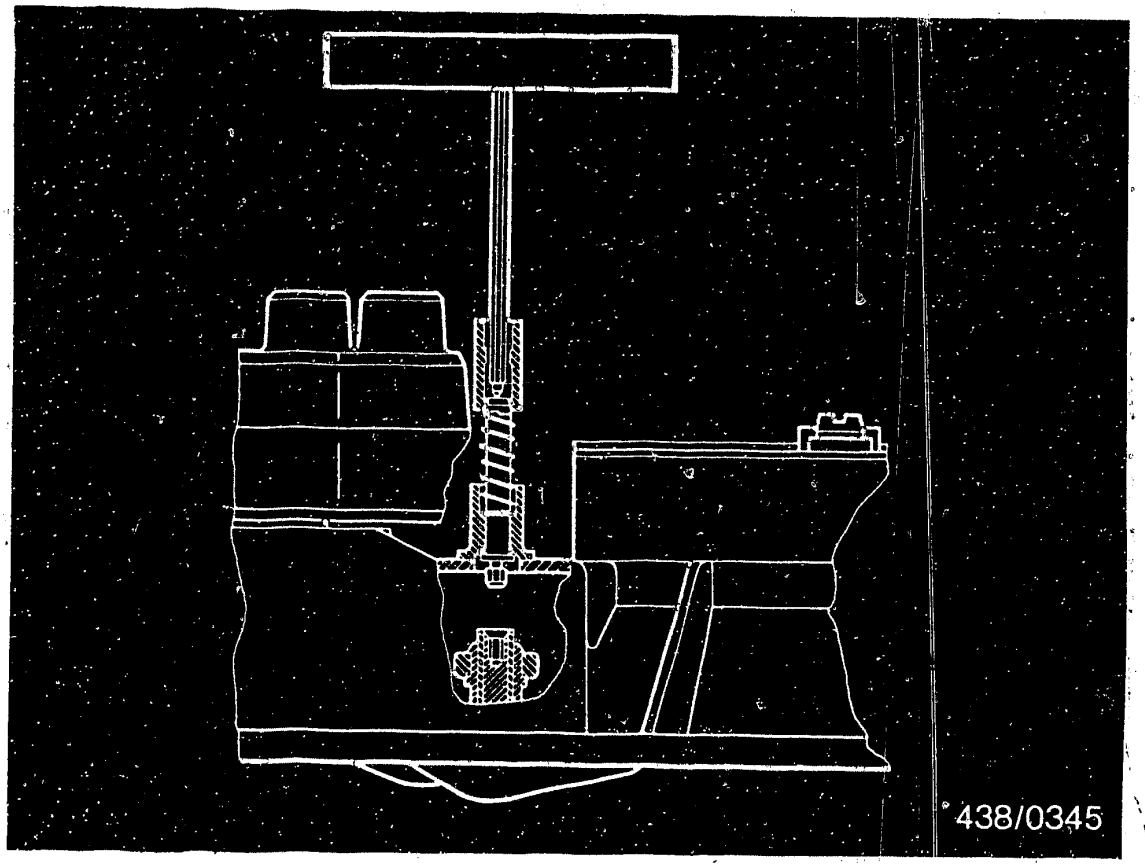


9.5 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor. Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.

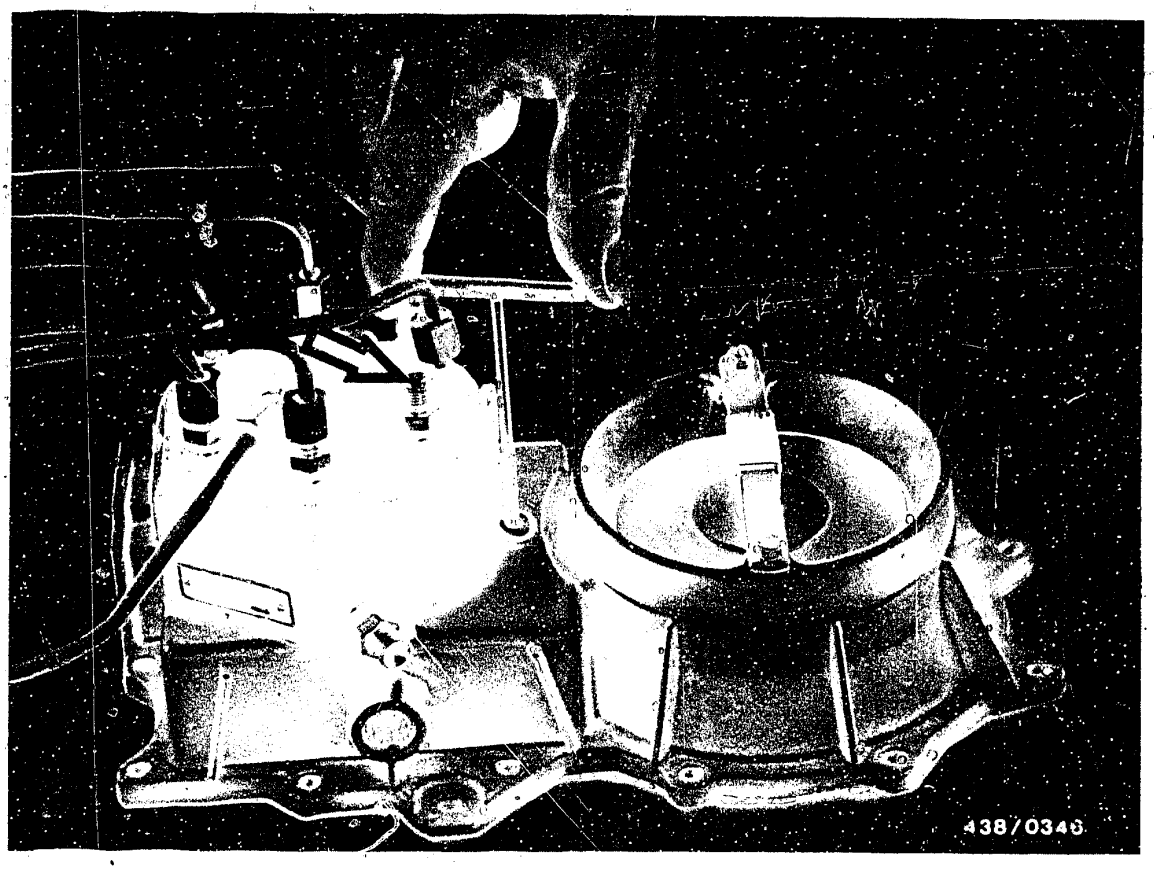
When connecting the fuel-injection tubing, use new seal rings.

Caution:
The connection screws of the fuel-injection lines on the fuel distributor should be tightened to a torque of 10...12 Nm (1...1.2 kgfm); if tightened too much, there is the danger that the lines may be crushed.



Matching the fuel distributor to the air-flow sensor for the initial start:

Screw off one injection line from the fuel distributor. Bridge the safety circuit so that the electric fuel pump operates.
The idle-mixture-adjusting screw is set via a setting device permanently fitted on the mixture-control unit and a spring-loaded hexagon-socket key.
To make the adjustment, carefully press down the hexagon socket key using an adjusting wrench KDEP 1035 until it locks in position in the idle-mixture-adjusting screw Remove the adjusting wrench after each setting has been carried out.
The hexagon-socket key is forced upwards by the built-in spring and automatically seals off the hole leading to the idle-mixture-adjusting screw by means of an O-ring seal.

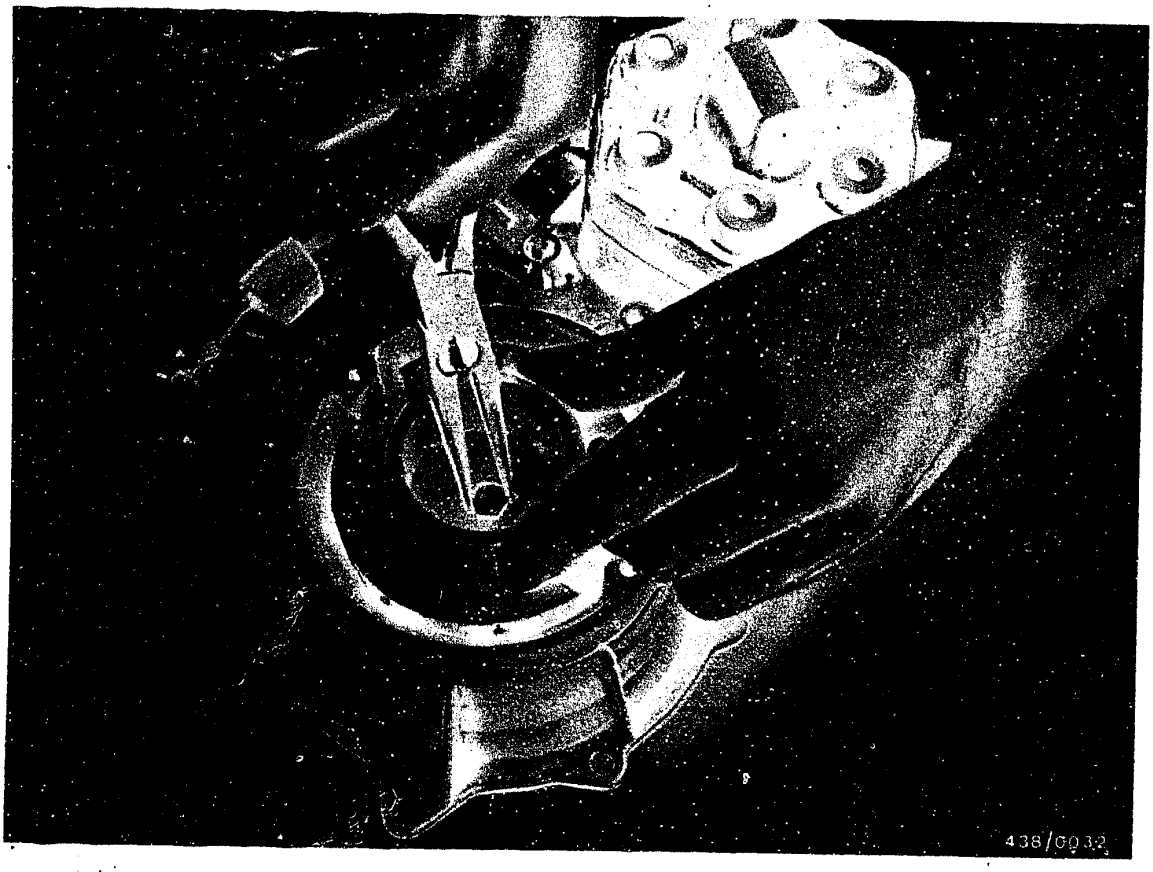


Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the adjusting screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F13-F19.



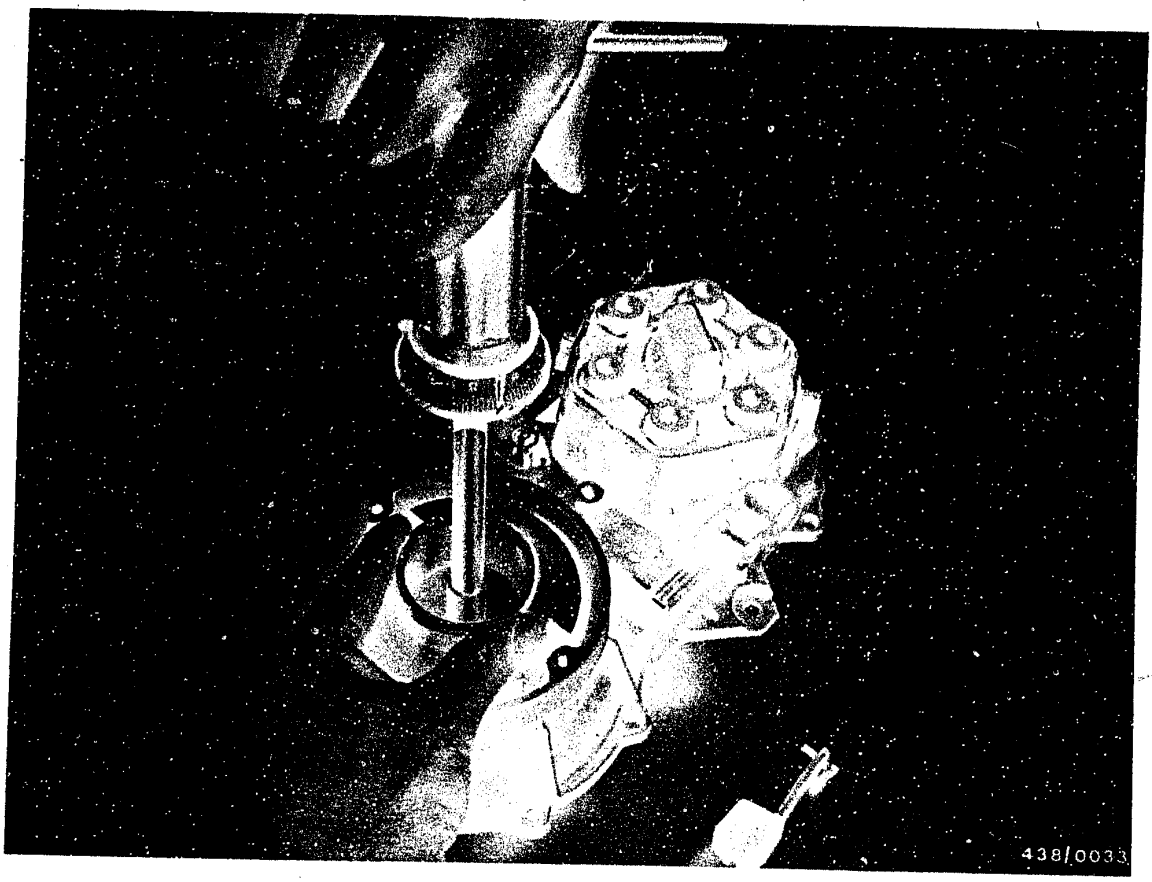
10. Checking and adjusting the position of the air-flow sensor plate

10.1 Preparations

- Engine temperature is not important.
- Remove the air filter so that the air-flow sensor plate becomes accessible.

10.2 Centering the air-flow sensor plate

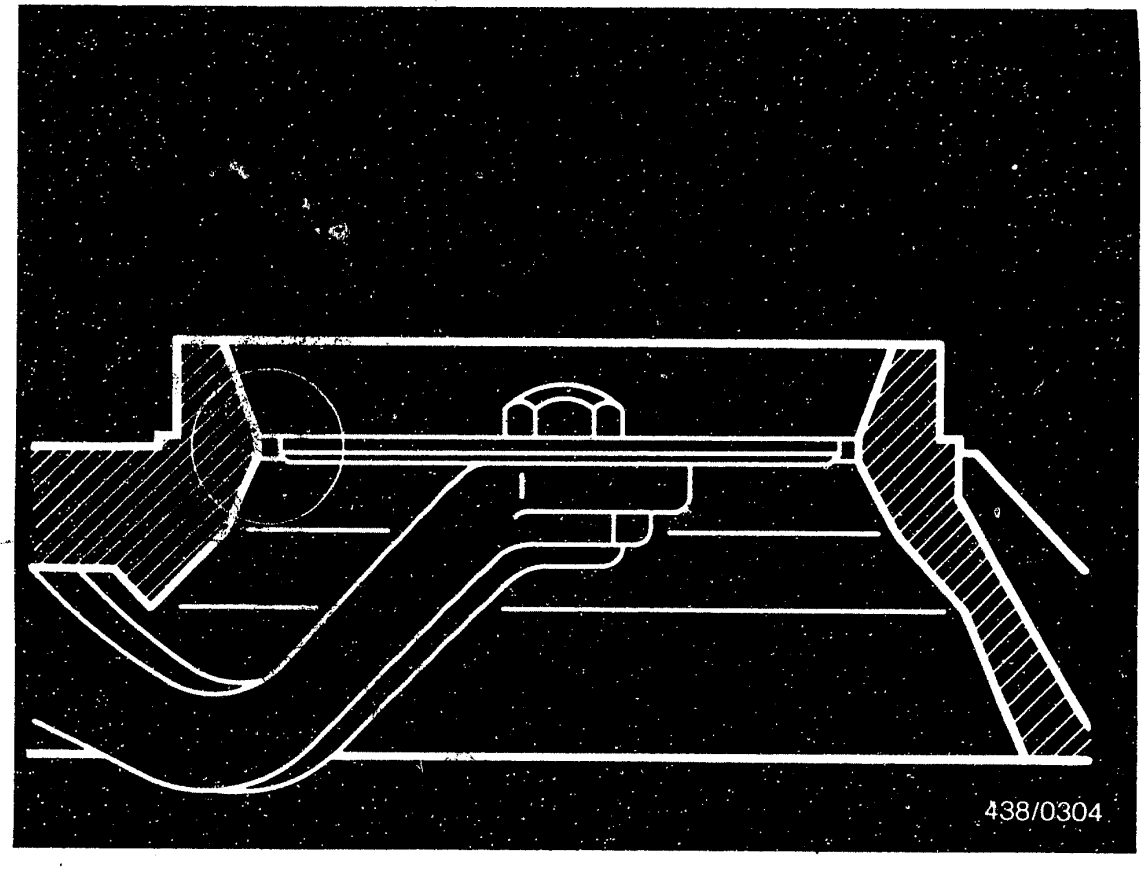
Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/13 (dia. 85 mm) as follows:



Remove the stop bracket after loosening the two fastening screws.

Loosen the sensor plate fastening screw. Insert the positioning ring while holding the fastening screws with pliers so that the sensor plate does not deflect downwards.

With the positioning ring in place, tighten the fastening screw with a torque of 5.0 ... 5.5 Nm, loosen again and tighten with the same torque.
When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).
It must not be possible to turn the sensor plate any further by hand.

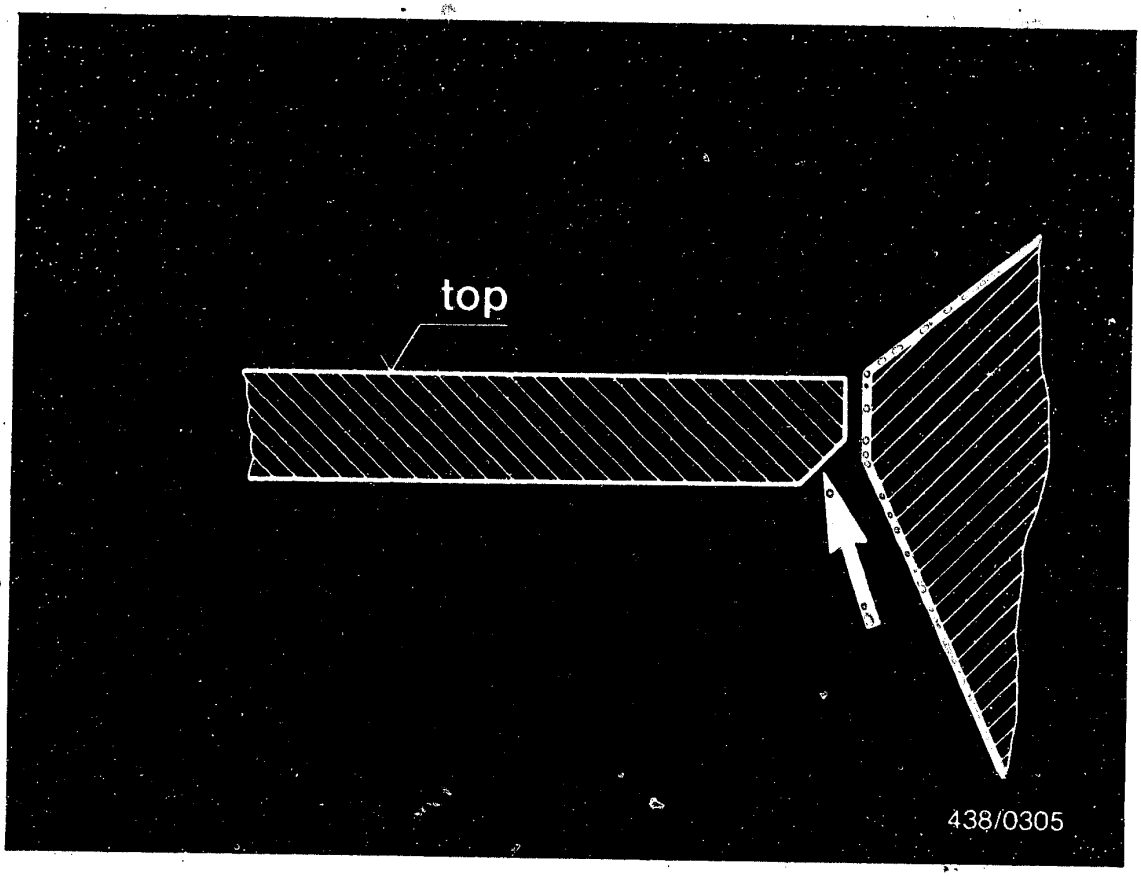


10.3 Checking and adjusting the zero position of the sensor plate
(Rest position):

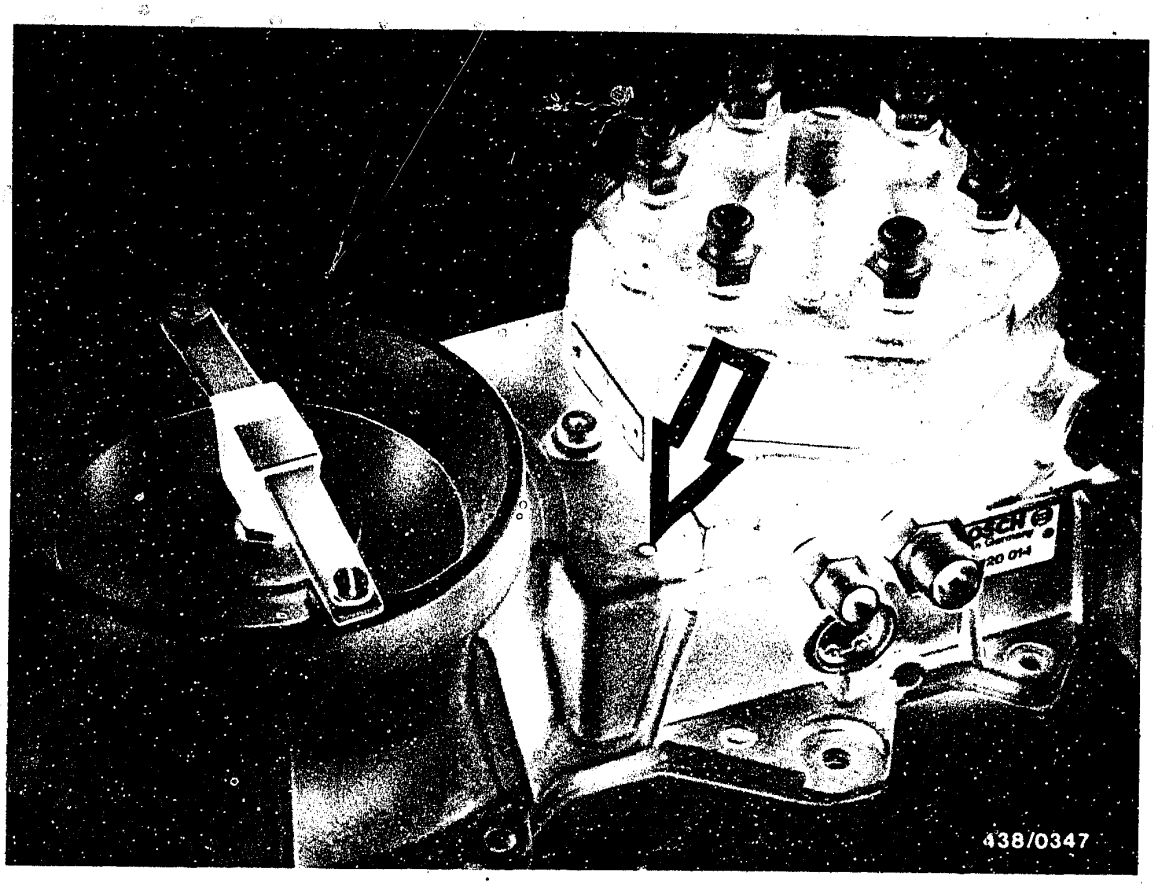
Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the beginning of the cone (relief funnel, top) or max. 0.5 mm higher.

The air-flow sensor plate must be flat and must not project at any point on its circumference outside the cylindrical part of the air funnel.

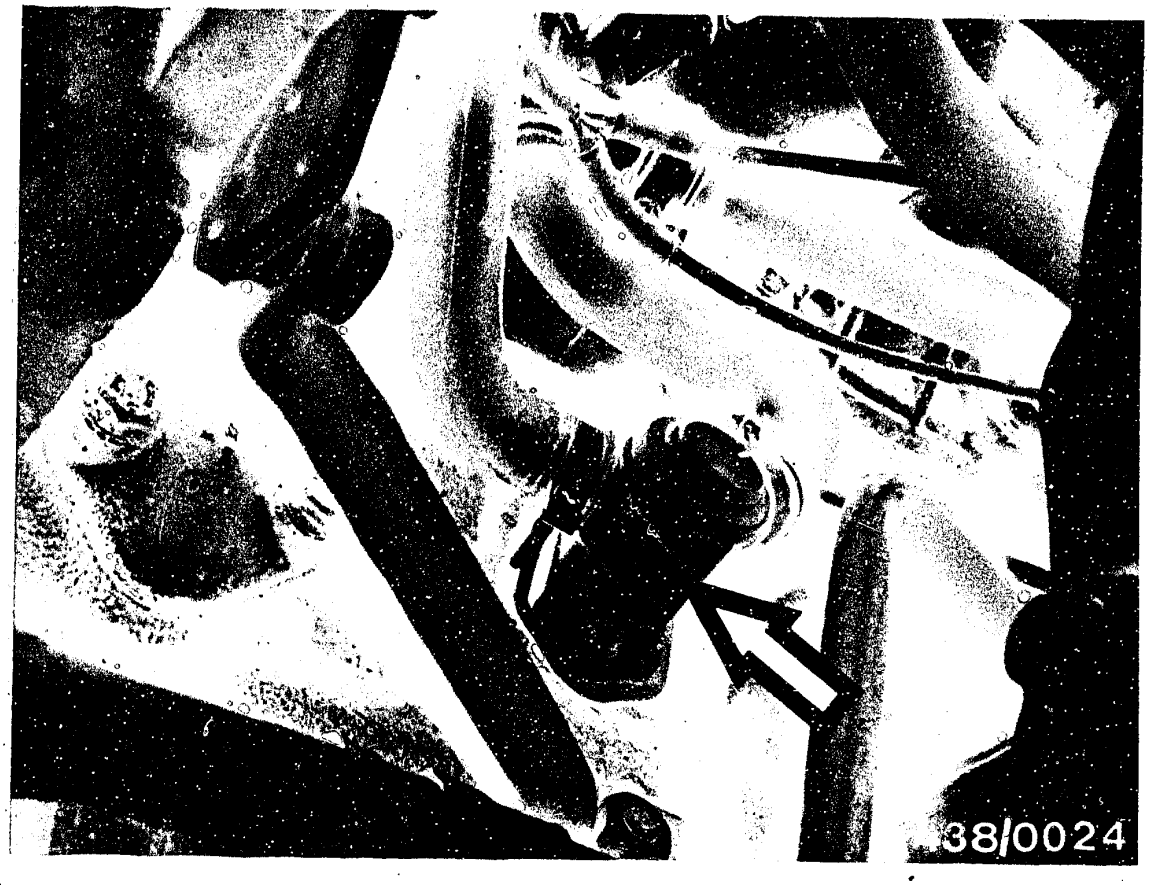


Caution:
The lower edge of the sensor plate is partially chamfered. Be absolutely sure that this chamfered edge is on the bottom (arrow). The upper side of the sensor plate is (in some cases) marked by the word "top".



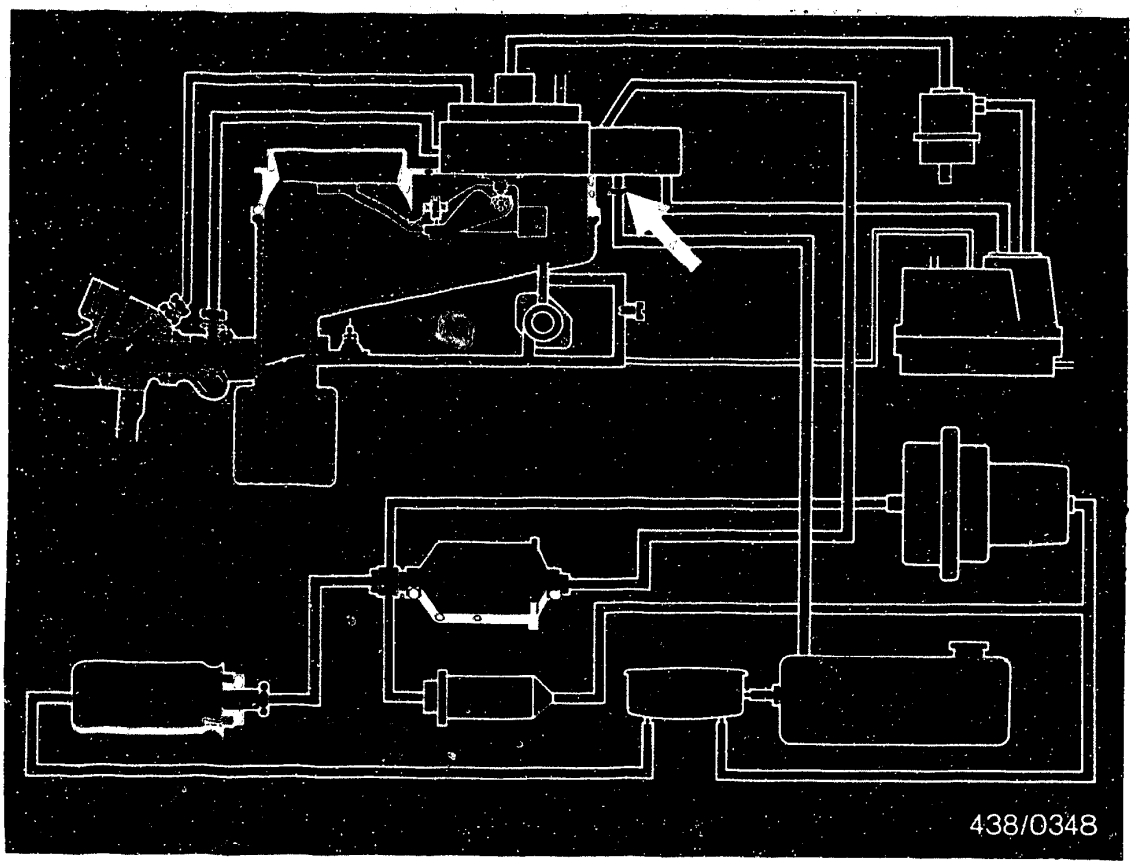
If the sensor plate is positioned too high, an adjustment can be made. To do this, drive the guide pin (arrow) for the leaf-spring limit-stop deeper using a mandrel and a light hammer.

Caution:
Make this adjustment very carefully so that the guide pin is not driven in too far.
Be absolutely sure to avoid repeated adjustments in both directions because this can loosen the press fit of the pin. Serious engine damage can result if this pin should drop out.



11. Checking the operation of the auxiliary-air device.

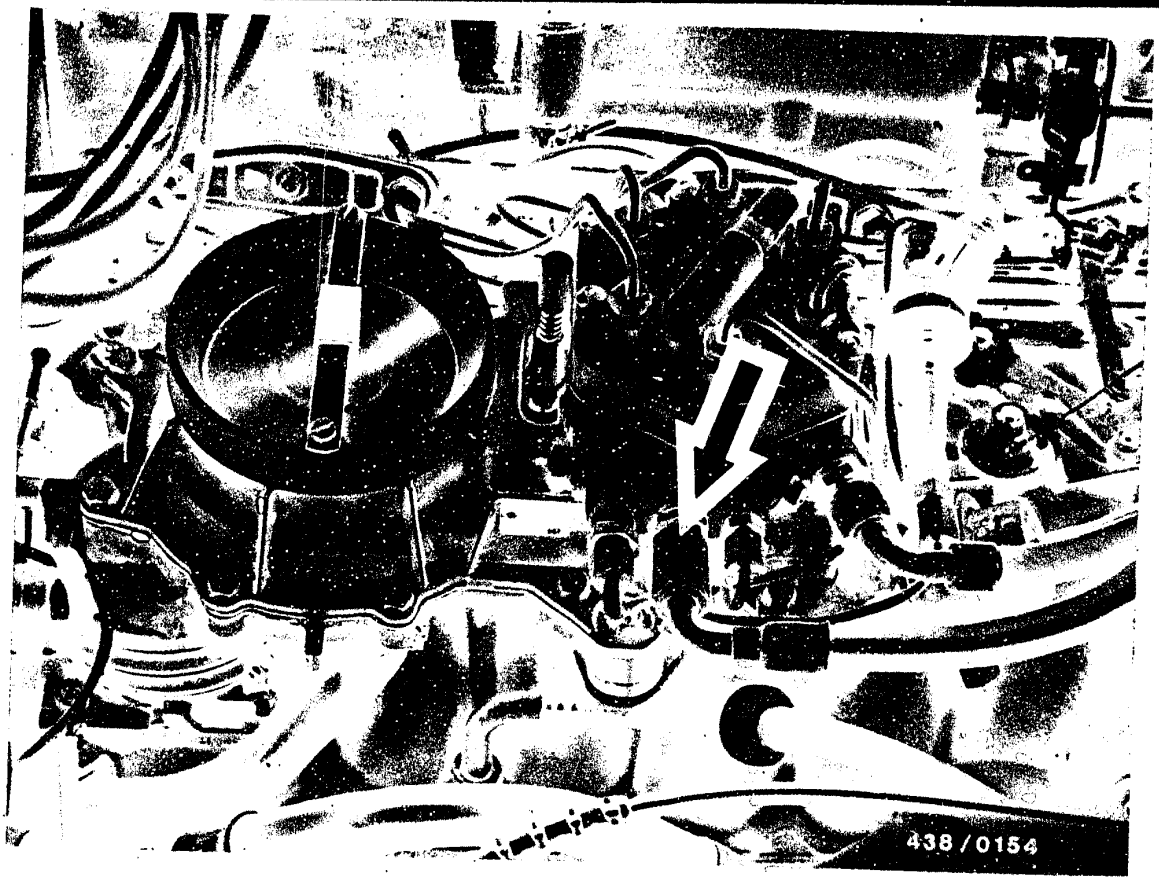
By means of a visual check (possibly by blowing through) ascertain whether the blocking plate is partially open when the engine is cold. To do so, loosen the hose clips and pull the hoses off the fittings.
Use a flashlight and mirror, if necessary, for the visual check.
If an opening is not visible when the engine is cold, replace the auxiliary-air device.
In order to check the closure of the blocking plate the engine is to be brought to normal operating temperature.
The auxiliary-air device blocking plate must close completely .
Defective auxiliary-air devices are to be replaced.
An electrical check is unnecessary because the device is heated by the engine coolant.



12. Checking the operation of the electric fuel pump.

12.1 Requirement

Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank (arrow).



12.2 Delivery of the electric fuel pump

Unscrew the fuel return line from the fuel distributor (arrow).

Equip a test hose (minimum inside diameter 8 mm) with a ball connector and union nut M 14 x 1.5 and connect to the return port of the fuel distributor.

Hold the end of the hose in a graduate (approx. 1.5 litres capacity) in order to make the measurement.

Pull off the plug from the warm-up regulator.

Switch on the electric fuel pump for 30 seconds by bridging the safety circuit.
Collect the fuel delivered during the 30 seconds in a graduate.

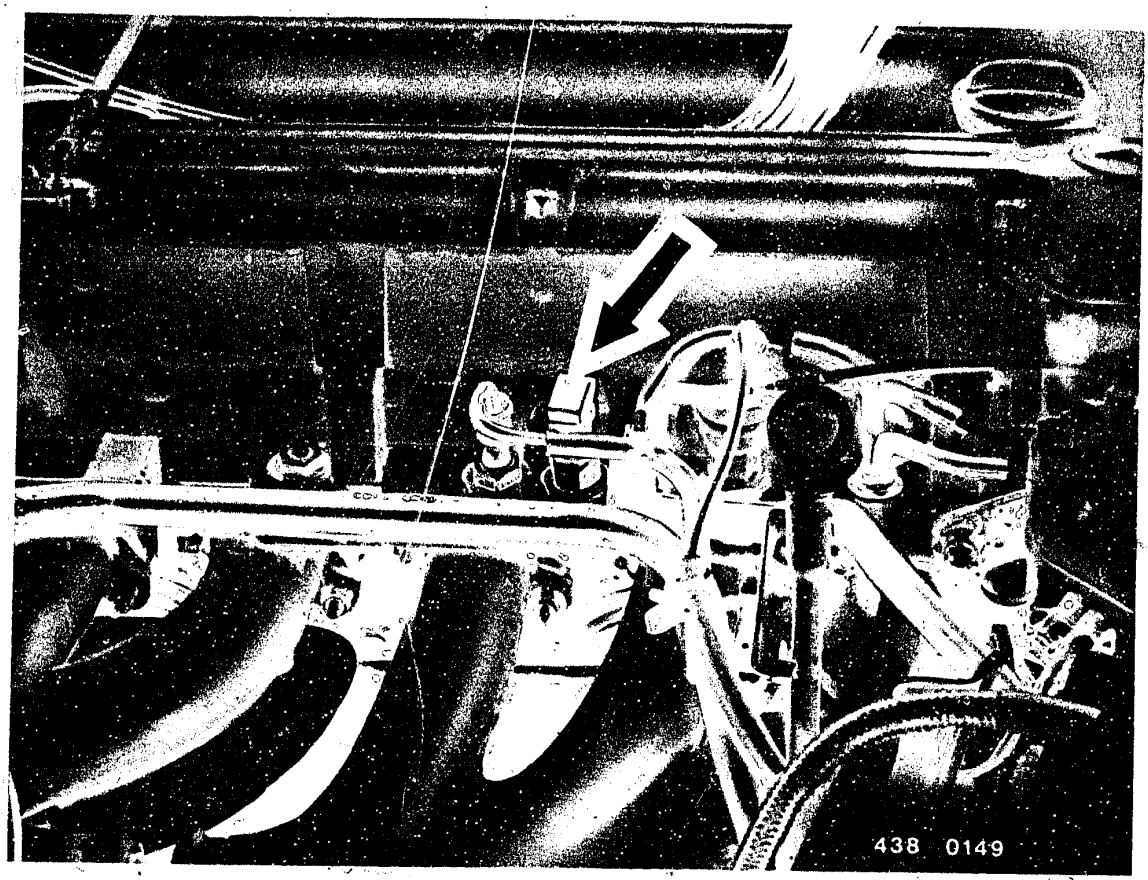
12.3 Test specification:

Fuel delivery: at least 930 cm^3/30 s

12.4 Possible causes of insufficient fuel delivery

- Power supply to the electric fuel pump defective.
- Voltage drop at the connection to the fuel pump. (Minimum voltage with the pump operating is 11.5 V).
- Fuel filter extremely dirty.
- Primary pressure too high.

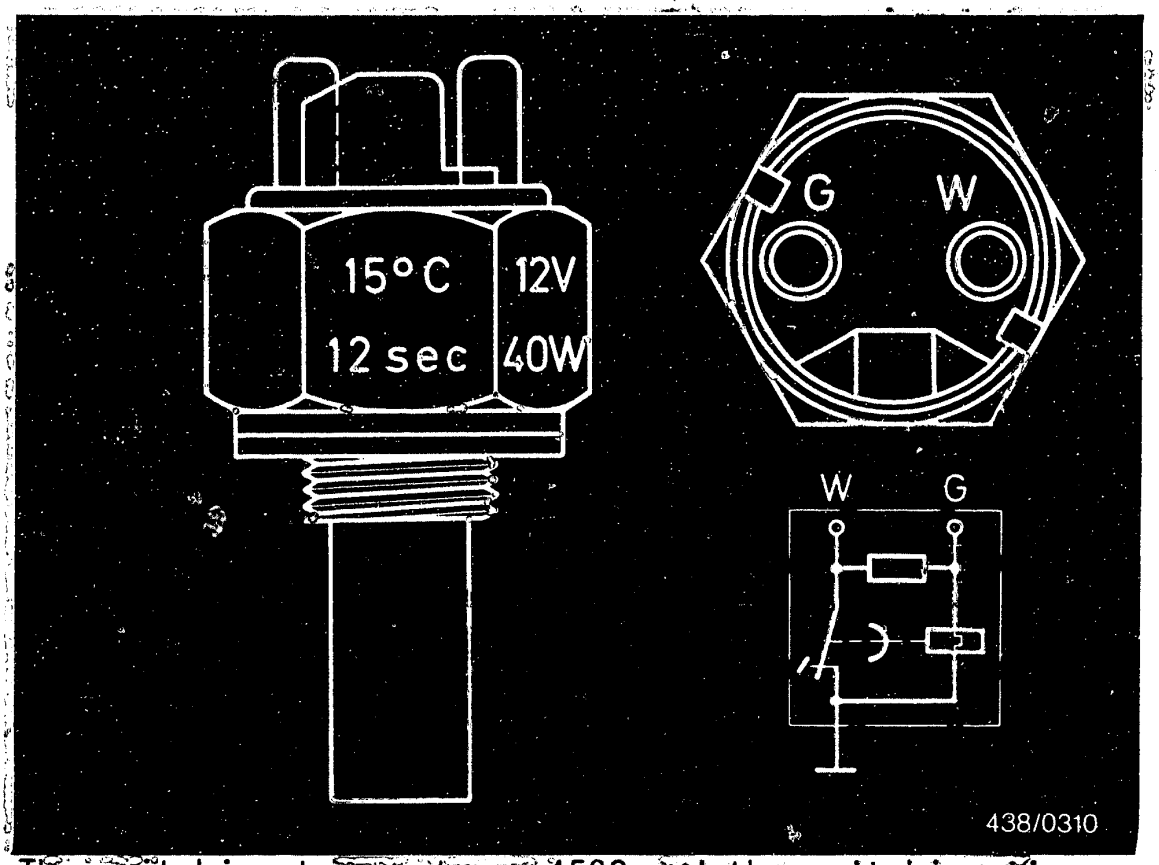
If these points do not apply, replace the fuel pump. To do this, pinch off the fuel intake hose from the fuel tank to the intake-noise damper (e.g. using hose clamper W 157 from Matra Co.).
When installing, pay attention to the correct position of the fuel pump. There is danger of bending the fuel lines.



13. Checking the cold-start system (thermo-time switch, cold-start valve).

13.1 Thermo-time switch (not a Bosch product)

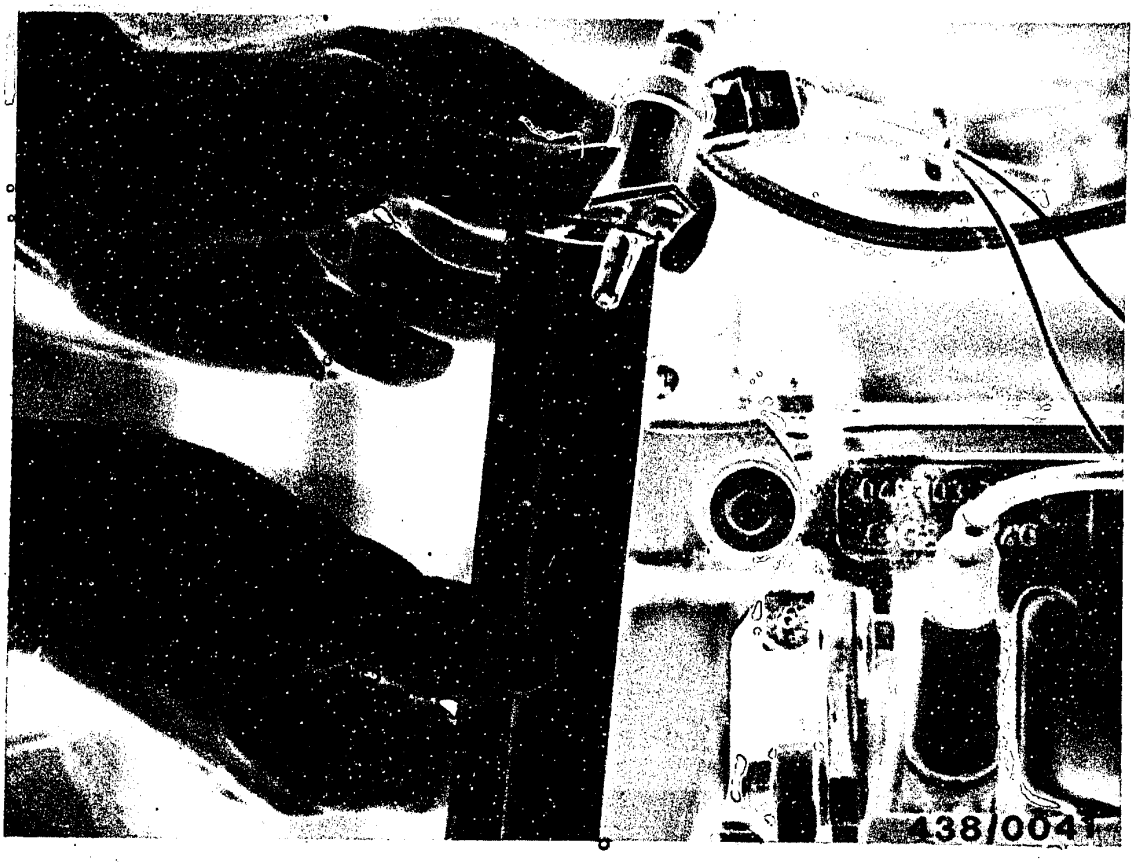
Pull off the plug.
Remove the thermo-time switch for testing.
Collect any escaping coolant in a container.



The switching temperature +15°C and the switching time at -20°C of 12 seconds are stamped into the hexagonal section of the thermo-time switch.

The removed thermo-time switch is tested using the ohmmeter in accordance with the specifications given below. The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

At a temperature below °C	above °C	Resistance measurement between Term. "G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term. "G" and term. "W"
+10	+20	40...60 Ω 50...70 Ω	0 Ω 240...300 Ω	40.. 60Ω 180..240Ω



13.2 Start valve

Remove the start valve. Connect a hose line instead of the steel tubing.
Pull off the plug and connect the start valve directly to ground and to terminal 15 (e.g. at the ignition coil) using connecting cable KDJE 7450/70.

Important note:
During this test, do not let the connecting cable touch B +.
Danger of fire due to sparking!

Hold the start valve in a suitable container (e.g. the graduate).
Switch on the electric fuel pump by bridging the safety circuit.
Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.
The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again.
Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates F13-F19.

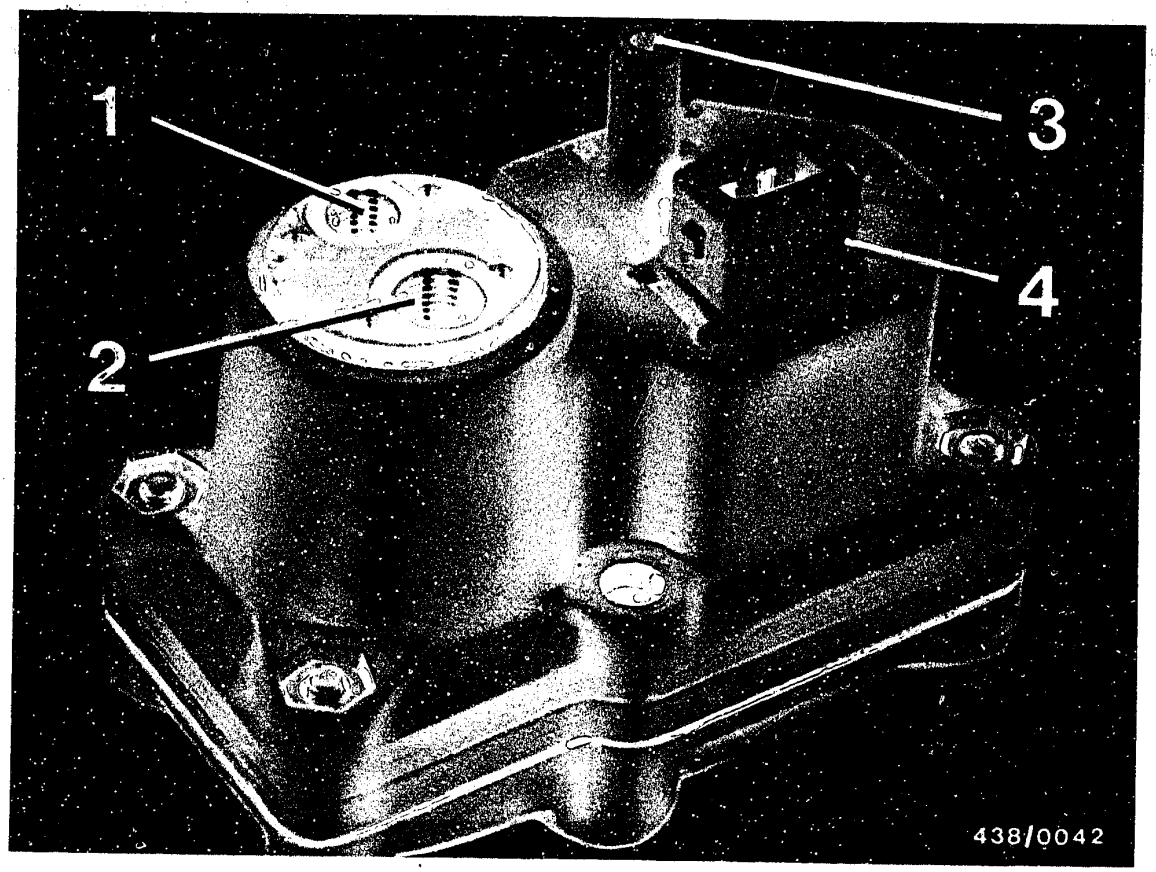
14. Checking the control pressures

14.1 Preliminary remarks:

The control pressures tested in the following are in each case governed by the warm-up regulator.
If the test results are incorrect, however, this may also be due to faults which are nothing to do with the warm-up regulator.

These possible faults are:

- No or too low a voltage at the electric connector.
- Fuel return from the warm-up regulator blocked or constricted.
- Too high a fuel delivery for the control-pressure circuit.
The testing of this control-pressure delivery is described as an additional test step at the beginning of the control pressure tests (Coordinate C16).
Reference is made to the other possible causes of trouble in the respective test step.

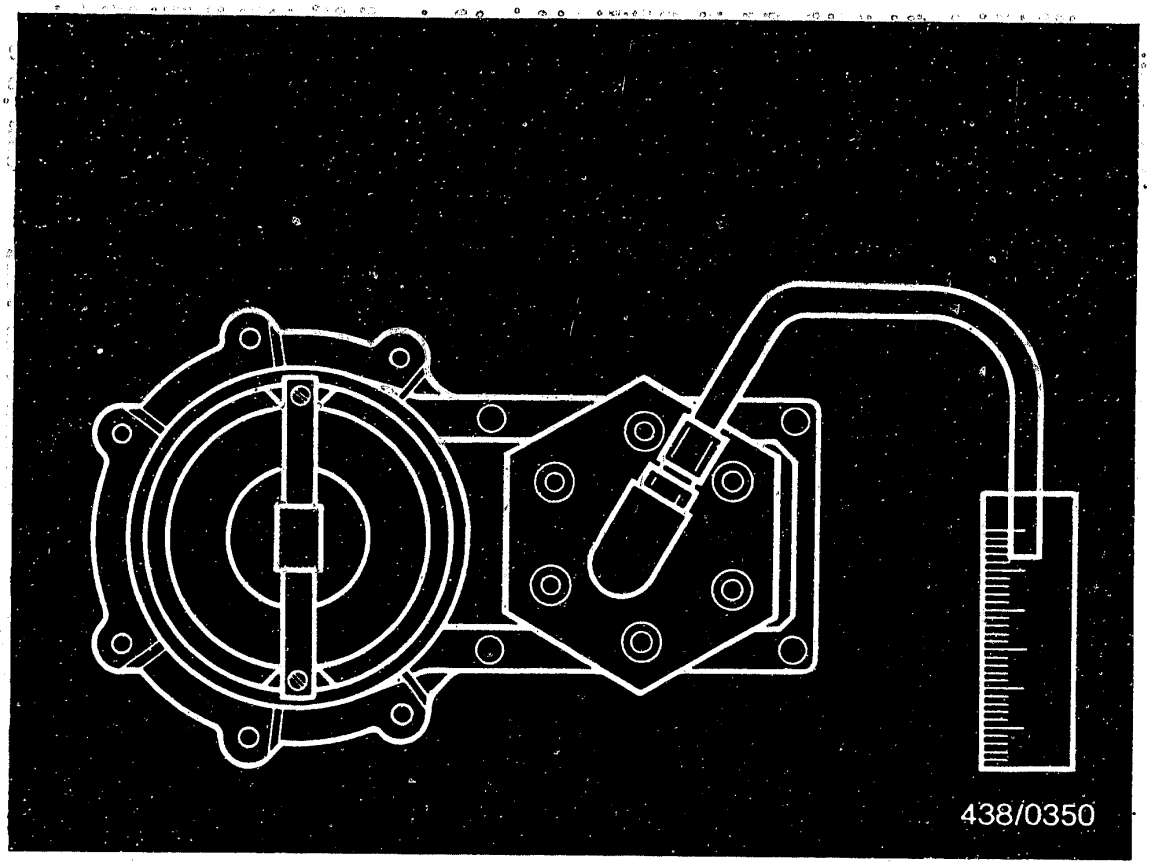


1 = Connection for return (M8 x 1)
2 = Connection for intake (M10 x 1)
3 = Connection to intake manifold
4 = Electrical connection

14.2 Warm-up regulator, model with intake-manifold-pressure controlled warm-up enrichment

The control pressures "warm" and "cold" are additionally influenced by the effect of the intake-manifold vacuum on the diaphragm of the warm-up regulator.

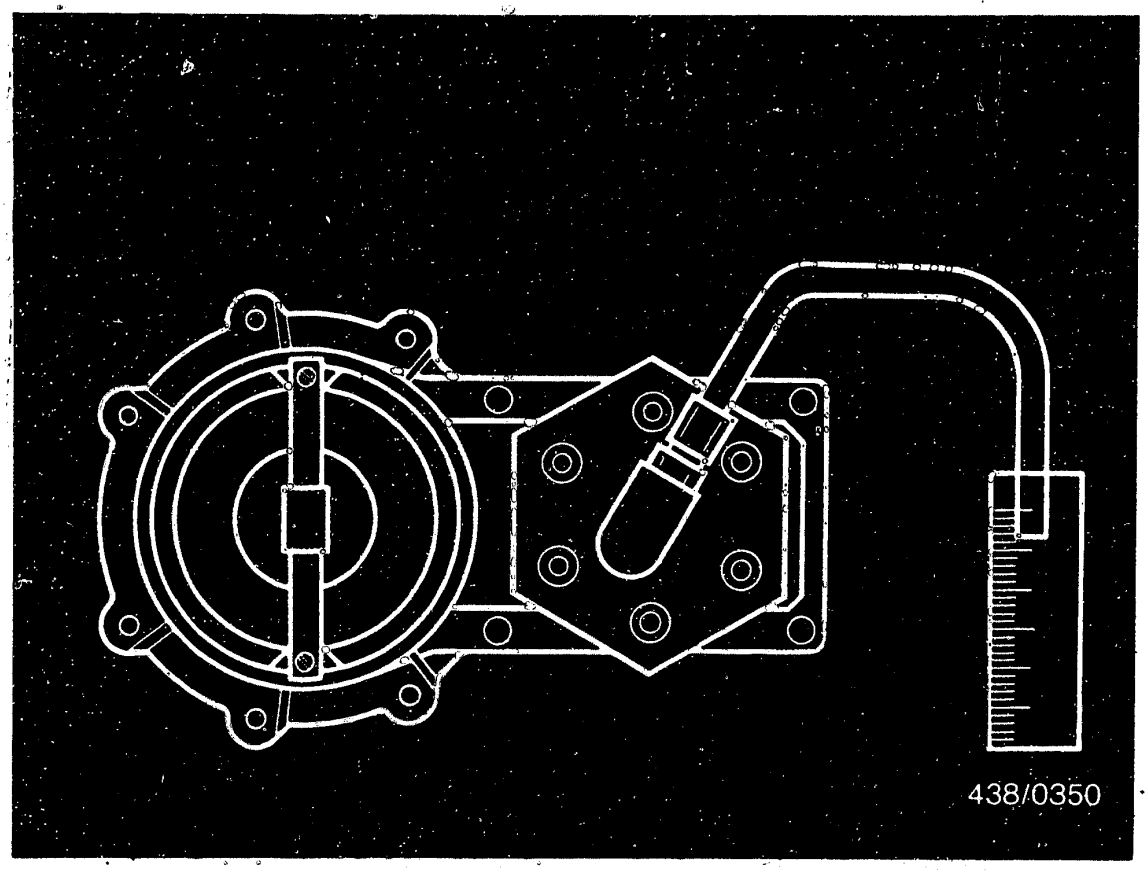
The connection to the intake manifold is on the top of the housing cover. There is a connection fitting in the baseplate for connection of the atmospheric pressure (connection at the engine on the fuel distributor side of the throttle valve).



14.3 Checking the fuel delivery for the control-pressure circuit:

Before testing, make sure that the electric fuel pump is operating properly (Coordinates C7-C9).
Unscrew the control-pressure line (to the warm-up regulator) from the fuel distributor.

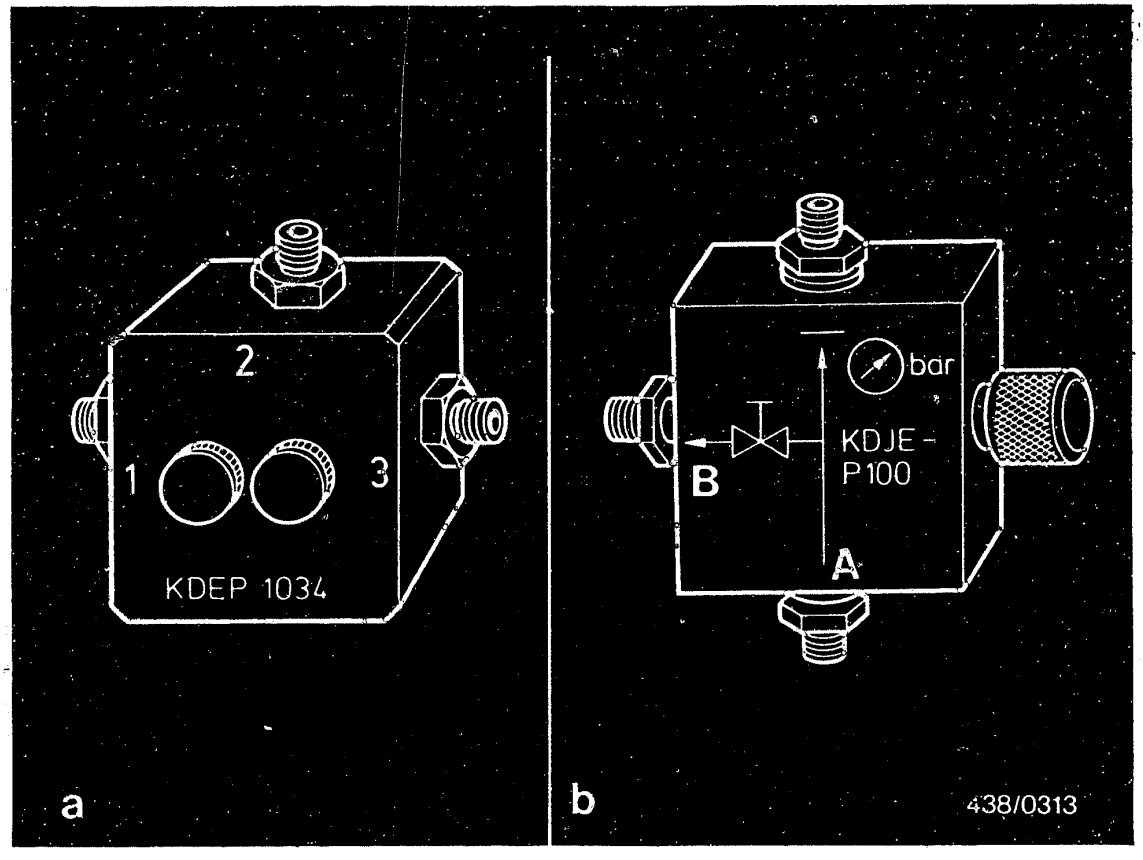
Connect the connecting hose KDJE-P100/11/1 (formerly KDEP 1034/11/1) of the pressure tester to the control-pressure port of the fuel distributor and hold hose in graduate (approx. 0.5 litre capacity).



Switch on the electric fuel pump for 1 minute by bridging the safety circuit.
Measure delivery.

Test specification: 160 ... 240 cm^3/min.

If the measured fuel value is outside tolerance, the fault is in the fuel distributor.
Replace the fuel distributor.



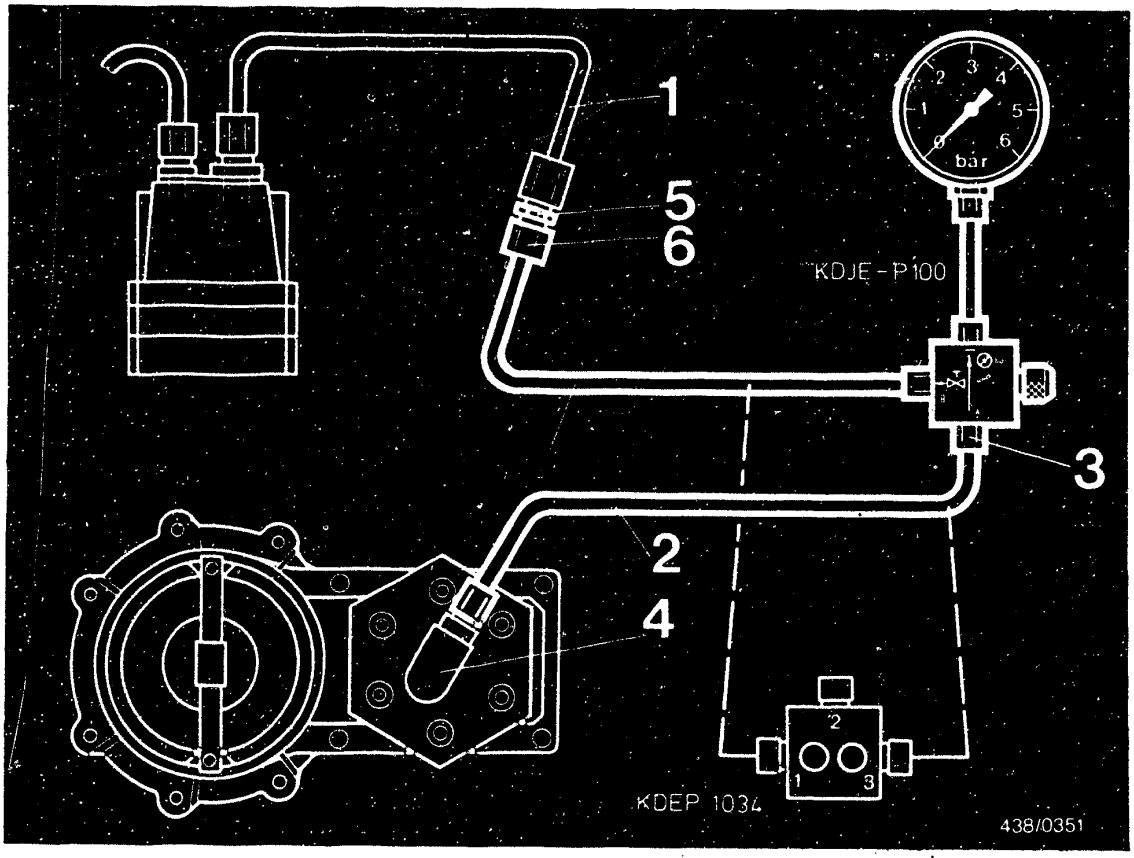
14.4 Mounting the pressure tester KDJE-P100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).

Since the end of 1979 the pressure tester KDJE-P100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



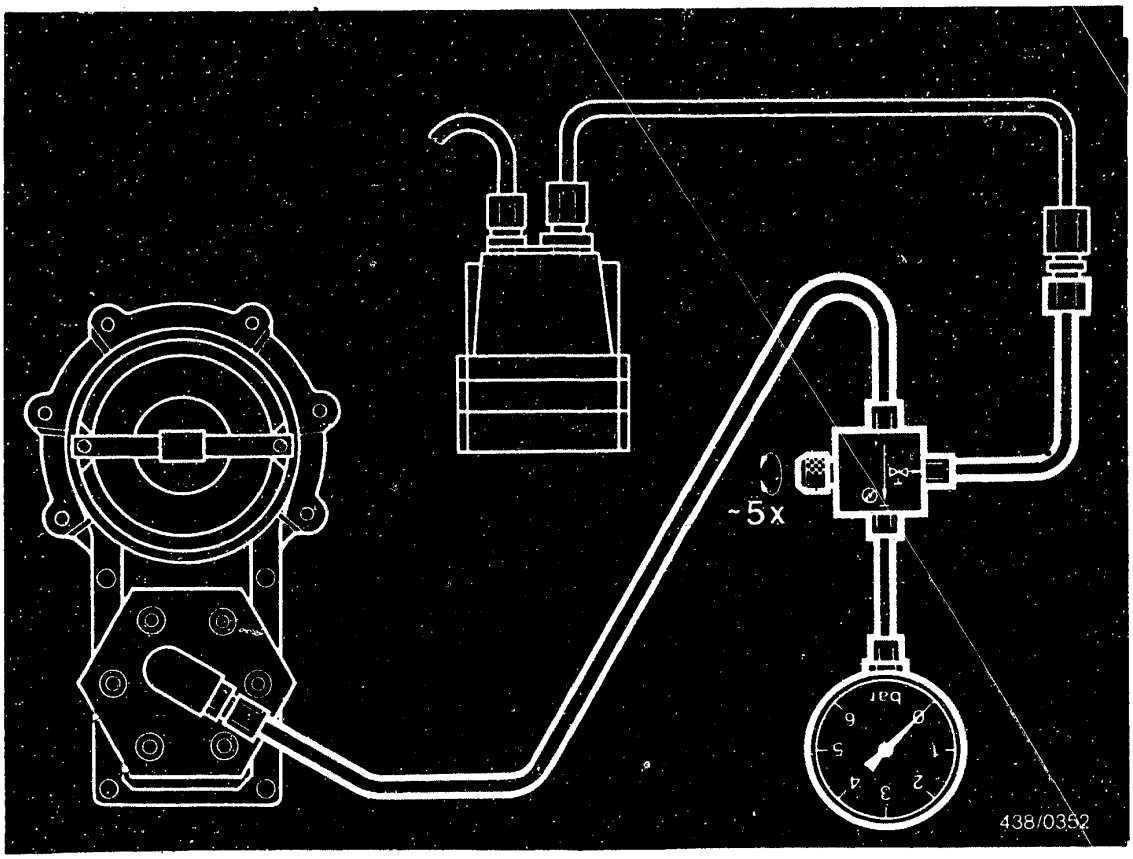
The directional-control valve is connected into the control-pressure line from the fuel distributor to the warm-up regulator:

The connecting-parts set KDJE-P100/11 (formerly KDEP 1034/11) is additionally required.

Unscrew the control-pressure line (1) from the fuel distributor. Connect the connecting hose KDJE-P100/11/1 (2) to the inlet fitting (3) of the directional-control valve and connect to control-pressure connection port (4) of the fuel distributor.

Screw double fitting (5) of the connecting-parts set into hose end (6) of directional-control valve and connect to control-pressure line (1).
Steel tubing of control-pressure line must not be bent!

Hang the pressure gauge from the hood (possibly using wire hook).



14.5 Bleeding the pressure tester

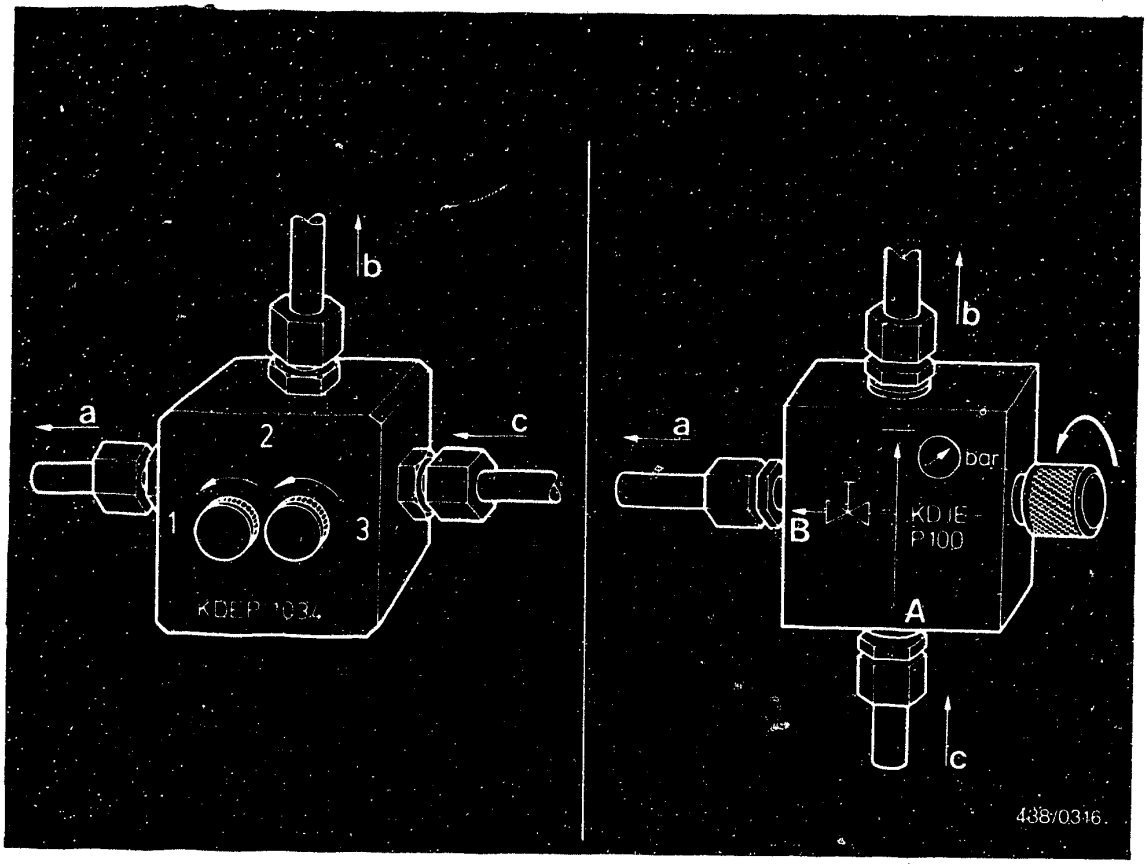
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

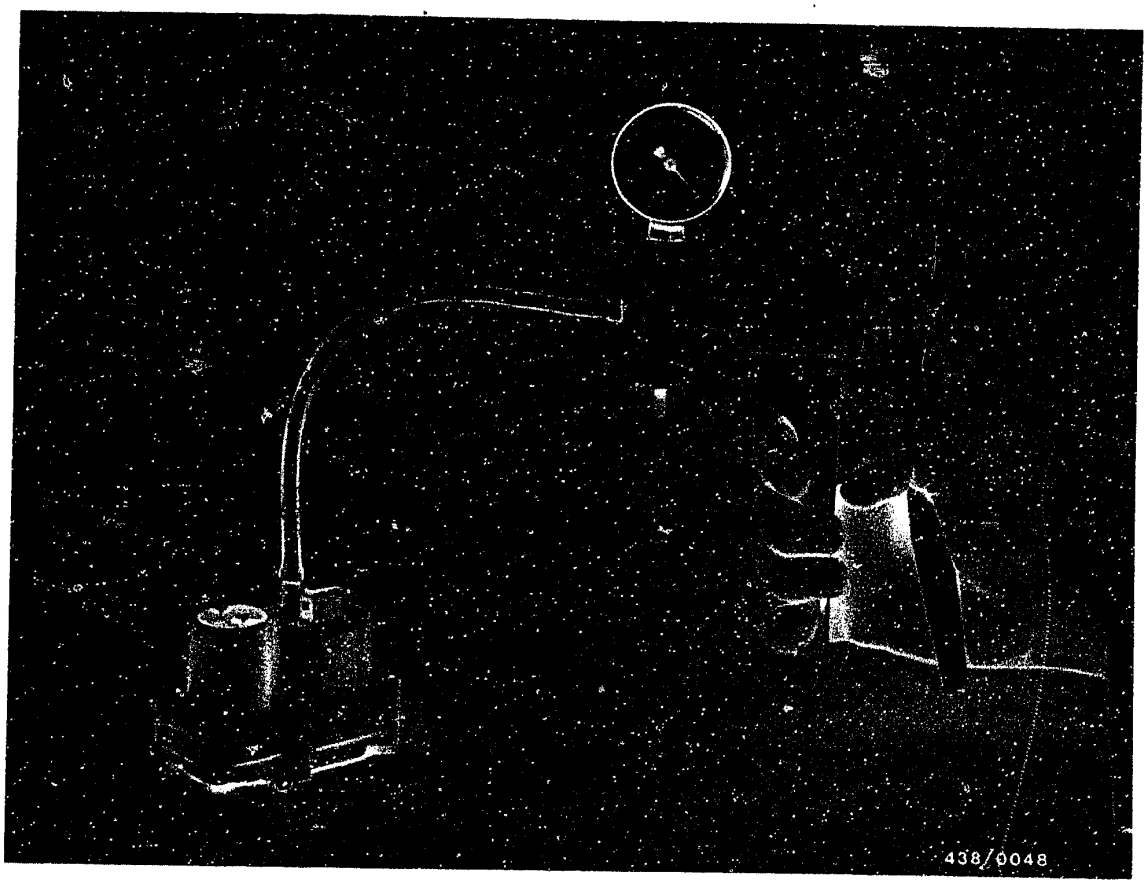
14.6 Testing the "cold" control pressure

The test is performed with the engine switched off. The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.

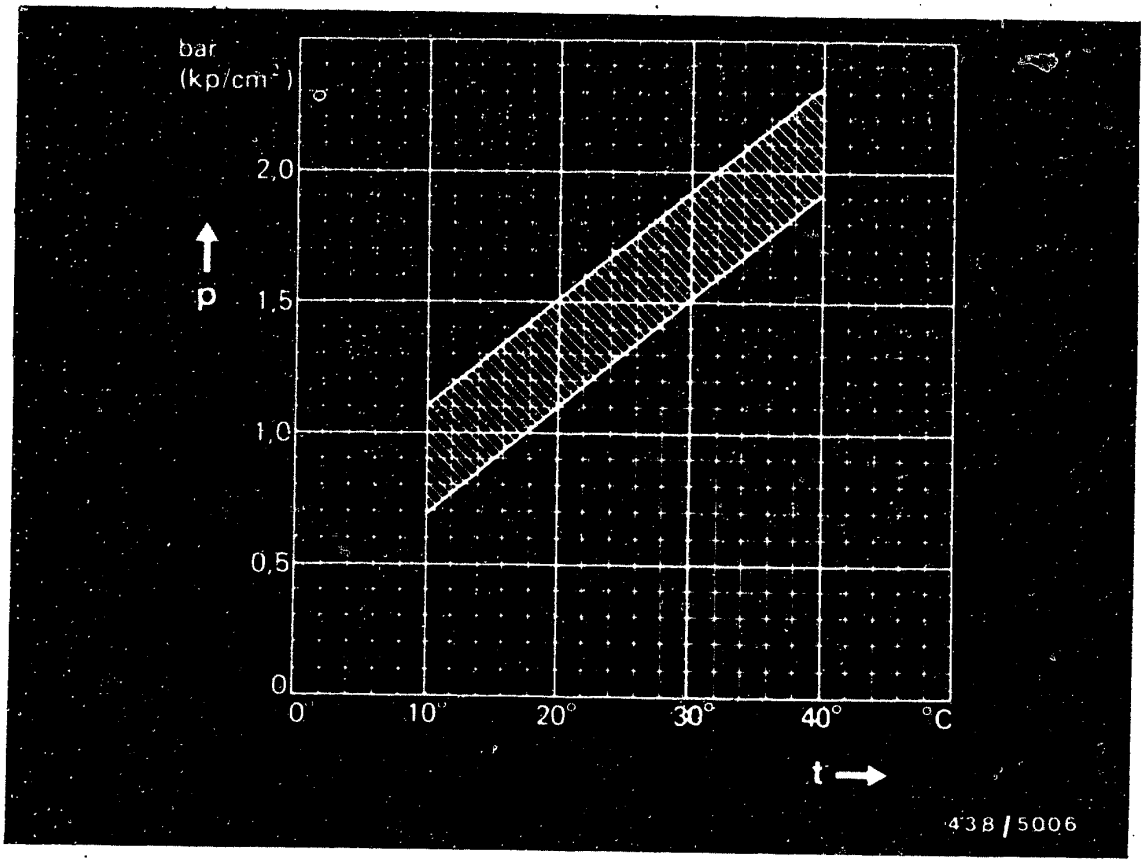
Pull off the plug from the warm-up regulator.

Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.



For this test it is necessary to use a vacuum pump with pressure gauge. It is connected to the intake-manifold connection of the warm-up regulator.
The Figure shows the test being carried out with the recommended "Mityvac" hand-operated vacuum pump.
Setting value: 510 ... 550 mbar (385 ... 415 Torr).



p = Control pressure (bar or kgf/cm² gauge pressure)
t = Ambient temperature (°C)

Warm-up regulator Part No.: 0 438 140 057

The pressure gauge of the pressure tester indicates the "cold" control pressure.
Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.
Example:
Ambient temperature = 20°C
Nominal control pressure = 1.0...1.5 bar gauge pressure

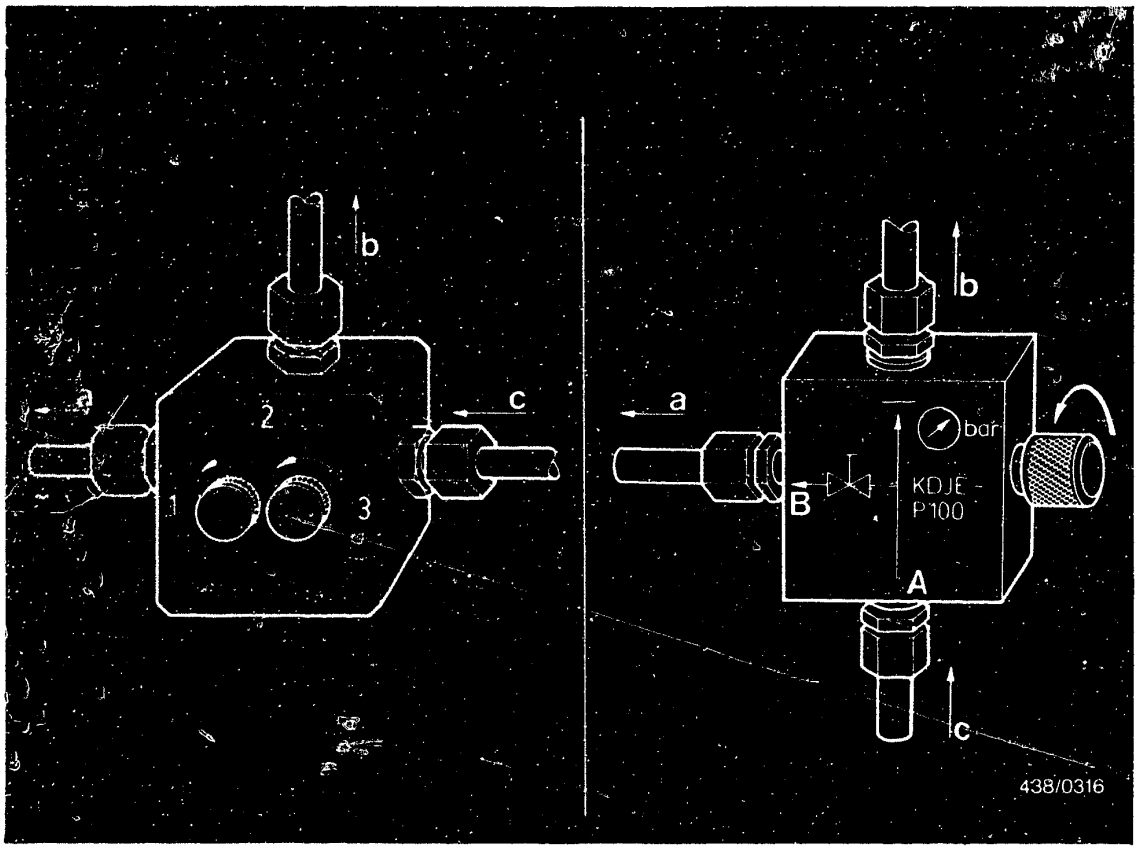
If the measured "cold" control pressure differs from the nominal value, this may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high. Test value: 160 ... 240 cm^3/min

- Fuel return from the warm-up regulator blocked or constricted (if control pressure too high).
Eliminate constriction.

- Warm-up regulator defective. Replace warm-up regulator.

If the warm-up regulator became defective due to dirt, then the replacement warm-up regulator is to be fitted with the tube fitting 1 433 356 802.
Tightening torque for this tube fitting: 20 ... 22 Nm (2 ... 2.2 kgfm).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.7 Checking the "warm" control pressure

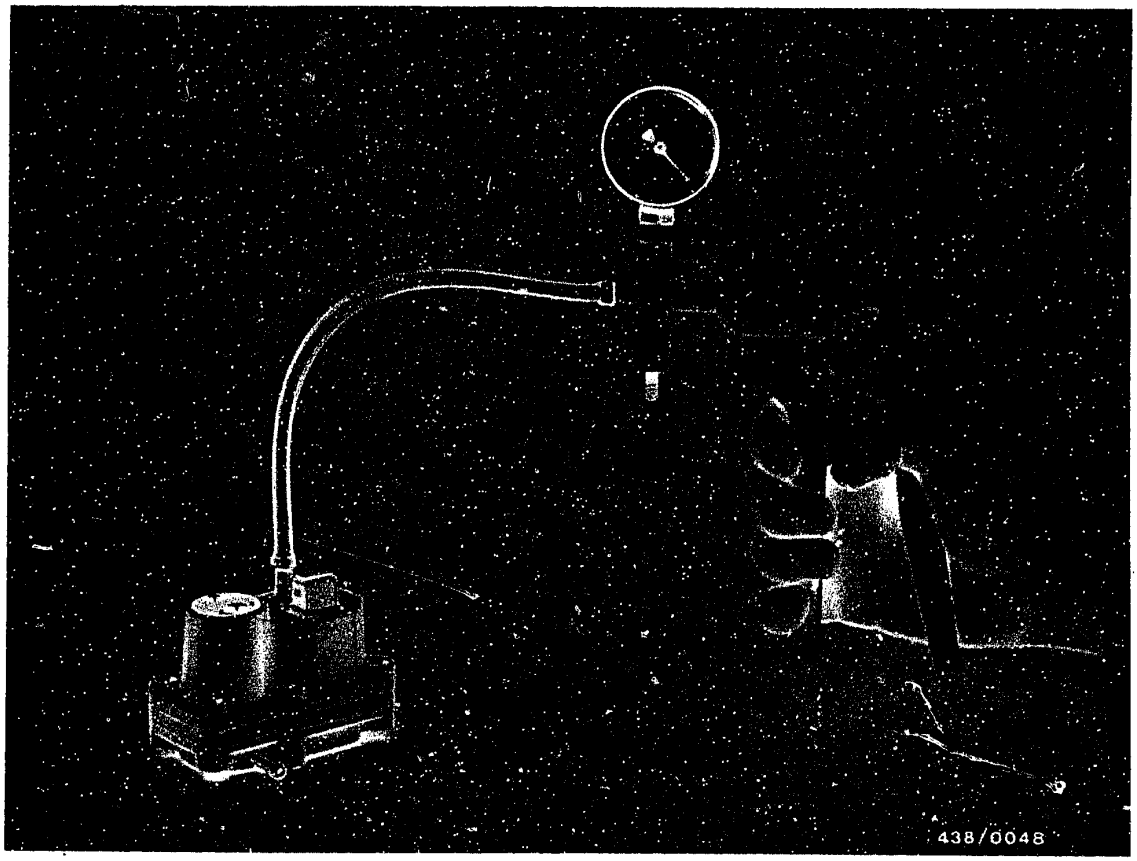
The test is carried out with the engine switched off. The temperature of the engine is not important.

Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Attach the plug to the warm-up regulator.

Control pressure now rises (the warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.



For this control pressure "warm " test, it is necessary to use a vacuum pump with pressure gauge. It is connected to the intake-manifold connection of the warm-up regulator.
The Figure shows the test being carried out with the recommended "Mityvac" hand-operated vacuum pump.
Setting value: 510 ... 550 mbar (385 ... 415 Torr).

Warm-up regulator Part Number: 0 438 140 057
The control pressure "warm" is registered on the pressure gauge.

Test value control-pressure "warm" (with intake-manifold pressure):

3.4 ... 3.8 bar (3.5 ... 3.9 kgf/cm²)
gauge pressure

Test value control pressure "warm" (with atmospheric pressure), i.e. with the engine switched off:

2.8 ... 3.2 bar (2.9 ... 3.3 kgf/cm²)
gauge pressure.

If the measured "warm" control pressure deviates from the test value specified, the following causes of defect are possible:

If the control pressure is too high:

- The amount of fuel delivered for the control-pressure circuit is excessive.
  Check the delivered fuel quantity.
  Test value: 160 ... 240 cm³/min
- Fuel return from the warm-up regulator is either blocked or restricted. Remove blockage or restriction.
- Hydraulic defect in the warm-up regulator.
  Replace the warm-up regulator.

If the warm-up regulator became defective due to dirt, then the replacement warm-up regulator is to be fitted with the tube fitting 1 433 356 802.
Tightening torque for this tube fitting: 20 ... 22 Nm (2 ... 2.2 kgfm).

If control pressure too low:

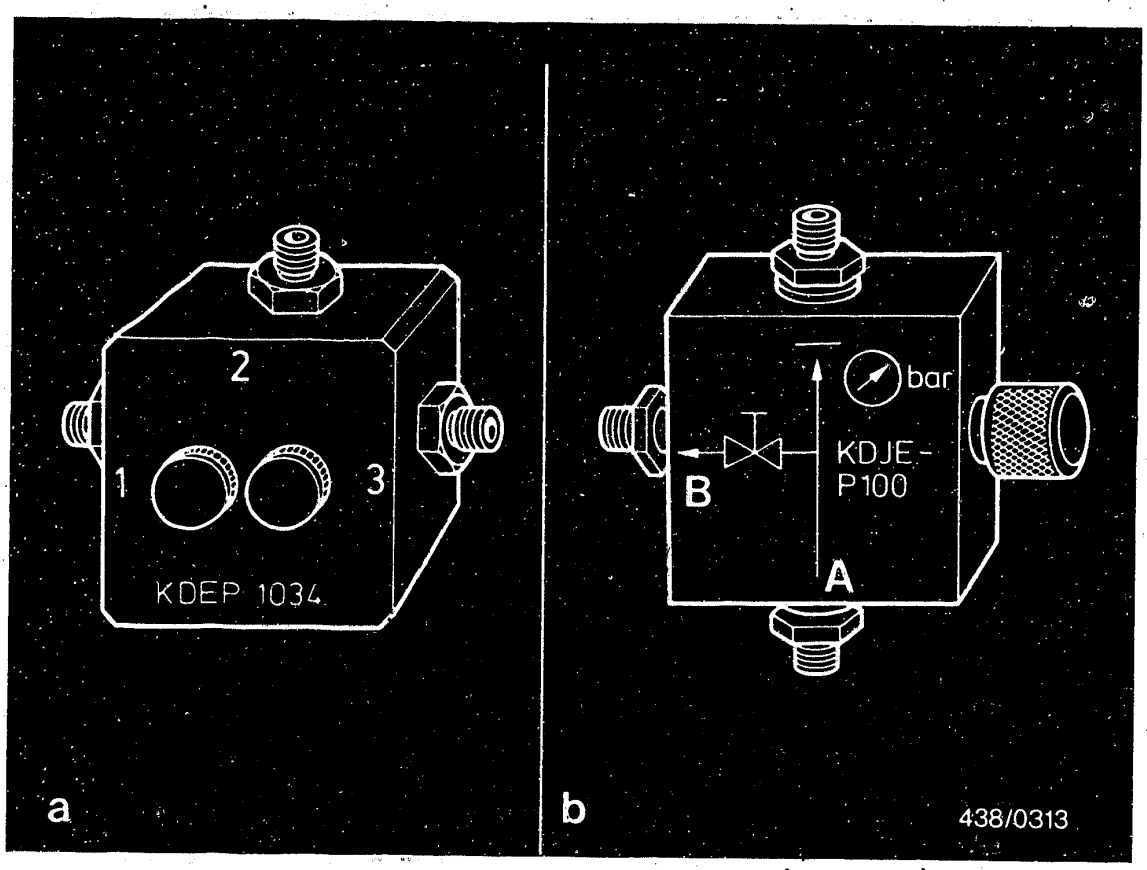
- Power-supply open-circuit.
  Eliminate open-circuit. Ensure that the plug is contacting correctly.

- Battery voltage too low, voltage drop.
  Eliminate voltage drop. Minimum voltage at connector: 11.5 V.
  If necessary, repeat test with the engine running in order to obtain the normal generator voltage of 14 V which is generated when the vehicle is in operation.

- Fuel delivery for the control-pressure circuit too low.
  Test delivered fuel quantity.
  Test value: 160 ... 240 cm^3/min

- Warm-up regulator defective. Heating filament open-circuit
  Hydraulic defect
  Leak at full-load diaphragm.
  Replace the warm-up regulator.

If the warm-up regulator has been replaced or a defect has been repaired, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates F13-F19.



15. Testing and adjusting the primary (system) pressure:

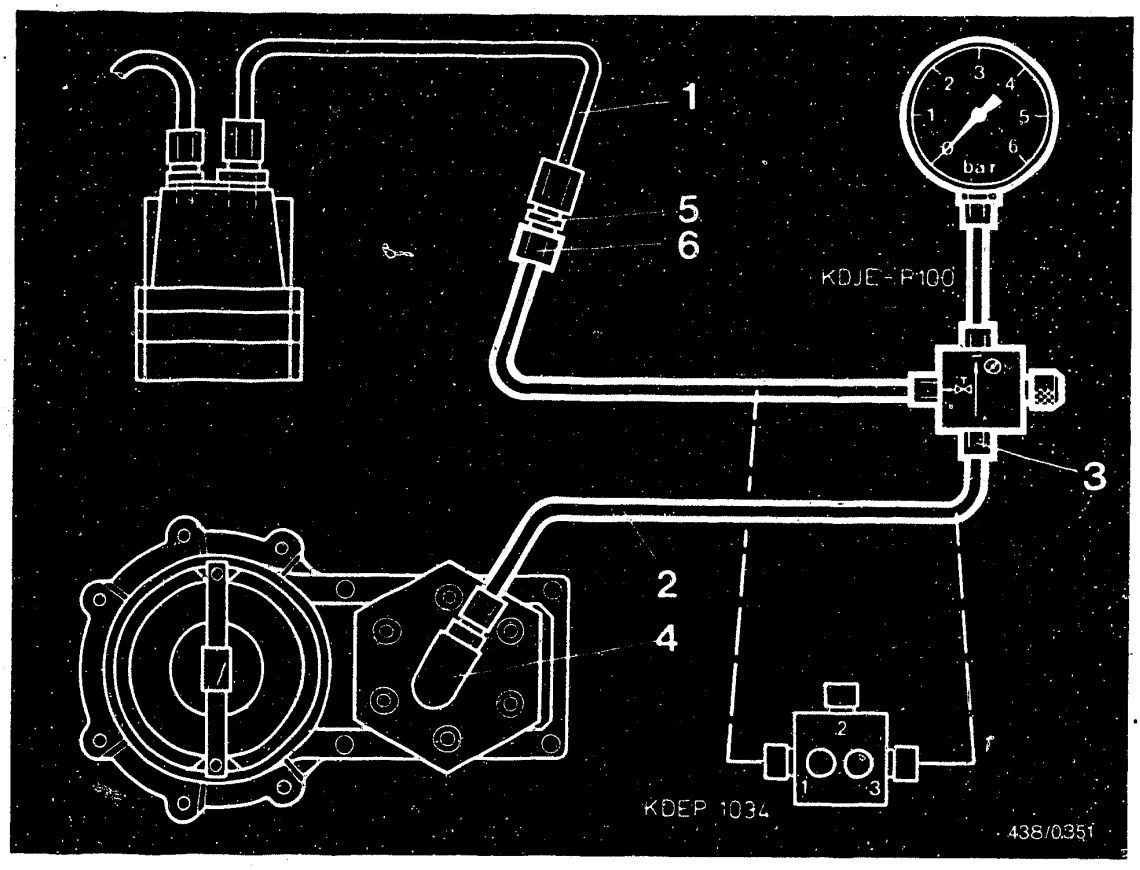
15.1 Mounting the pressure tester KDJE-P100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).

Since the end of 1979 the pressure tester KDJE-P100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



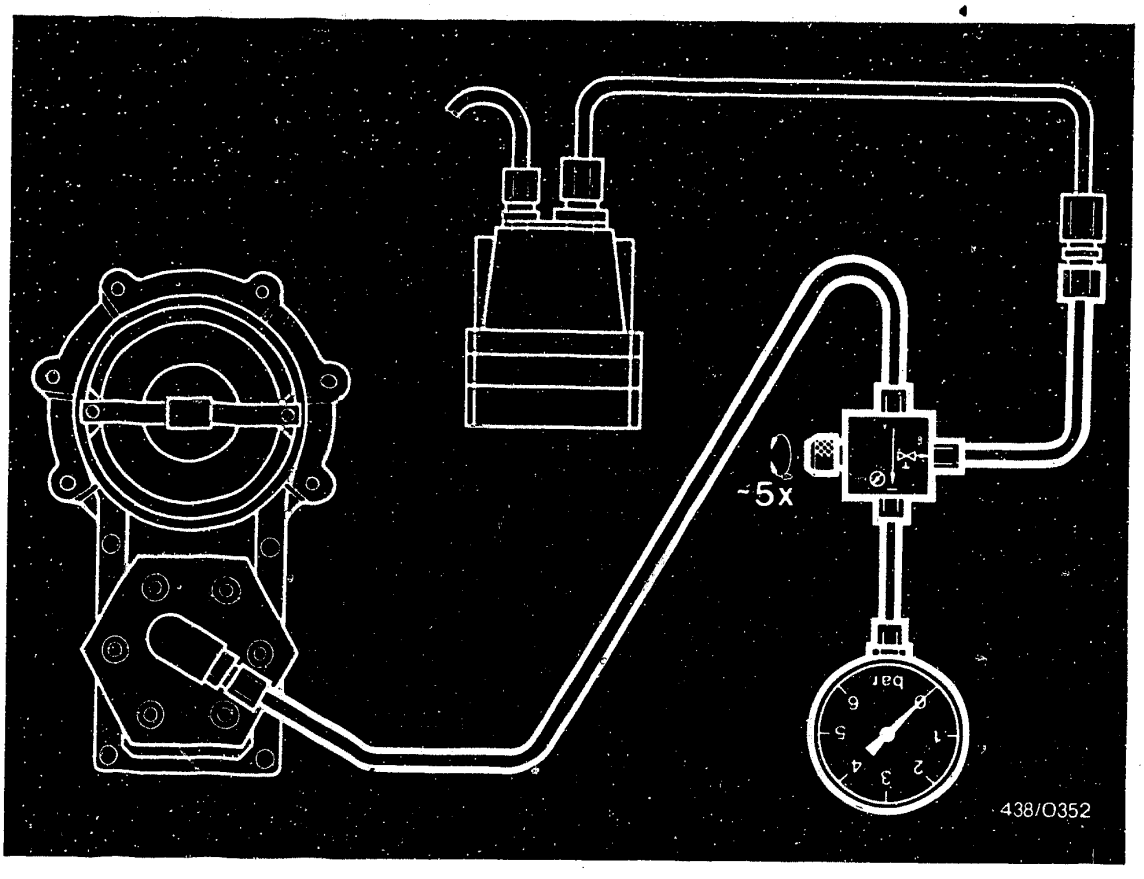
The directional-control valve is connected into the control-pressure line from the fuel distributor to the warm-up regulator:

The connecting-parts set KDJE-P100/11 (formerly KDEP 1034/11) is additionally required.

Unscrew the control-pressure line (1) from the fuel distributor. Connect the connecting hose KDJE-P100/11/1 (2) to the inlet fitting (3) of the directional-control valve and connect to control-pressure connection port (4) of the fuel distributor.

Screw double fitting (5) of the connecting-parts set into hose end (6) of directional-control valve and connect to control-pressure line (1).
Steel tubing of control-pressure line must not be bent!

Hang the pressure gauge from the hood (possibly using wire hook).



15.2 Bleeding the pressure tester

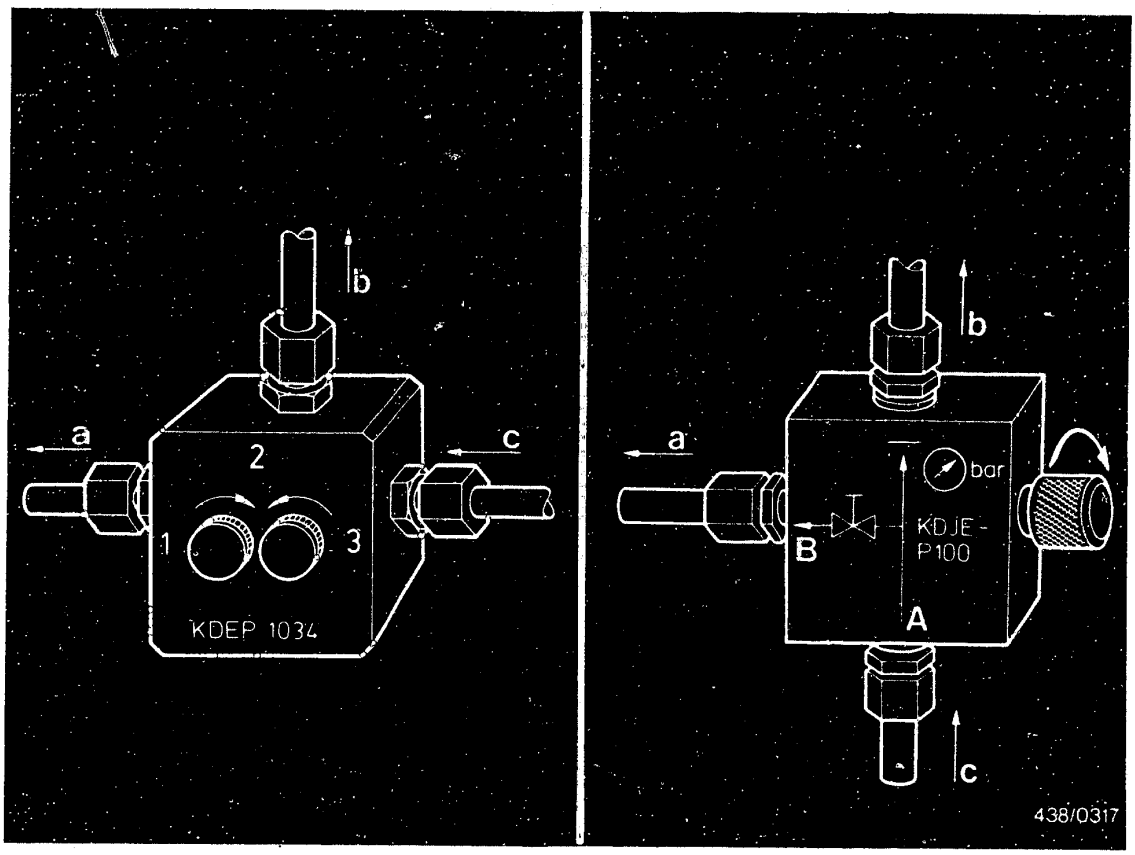
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electrical fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.3 Testing the primary pressure:

The test is performed with the engine switched off. The temperature of the engine is not important. Close the valve screw of directional-control valve KDJE-P100.
In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Switch on the electric fuel pump by bridging the electrical safety circuit.

The pressure gauge now indicates the primary pressure.

Fuel distributor Part Number	Test specifications Primary pressure
0 438 100 040 0 438 100 069 0 438 100 085 0 438 100 099 0 438 100 106	4.7 ... 5.4 bar (4.8 ... 5.5 kgf/cm²)
0 438 100 011 0 438 100 084	5.0 ... 5.6 bar (5.1 ... 5.7 kgf/cm²)

Possible causes for too low a primary pressure:

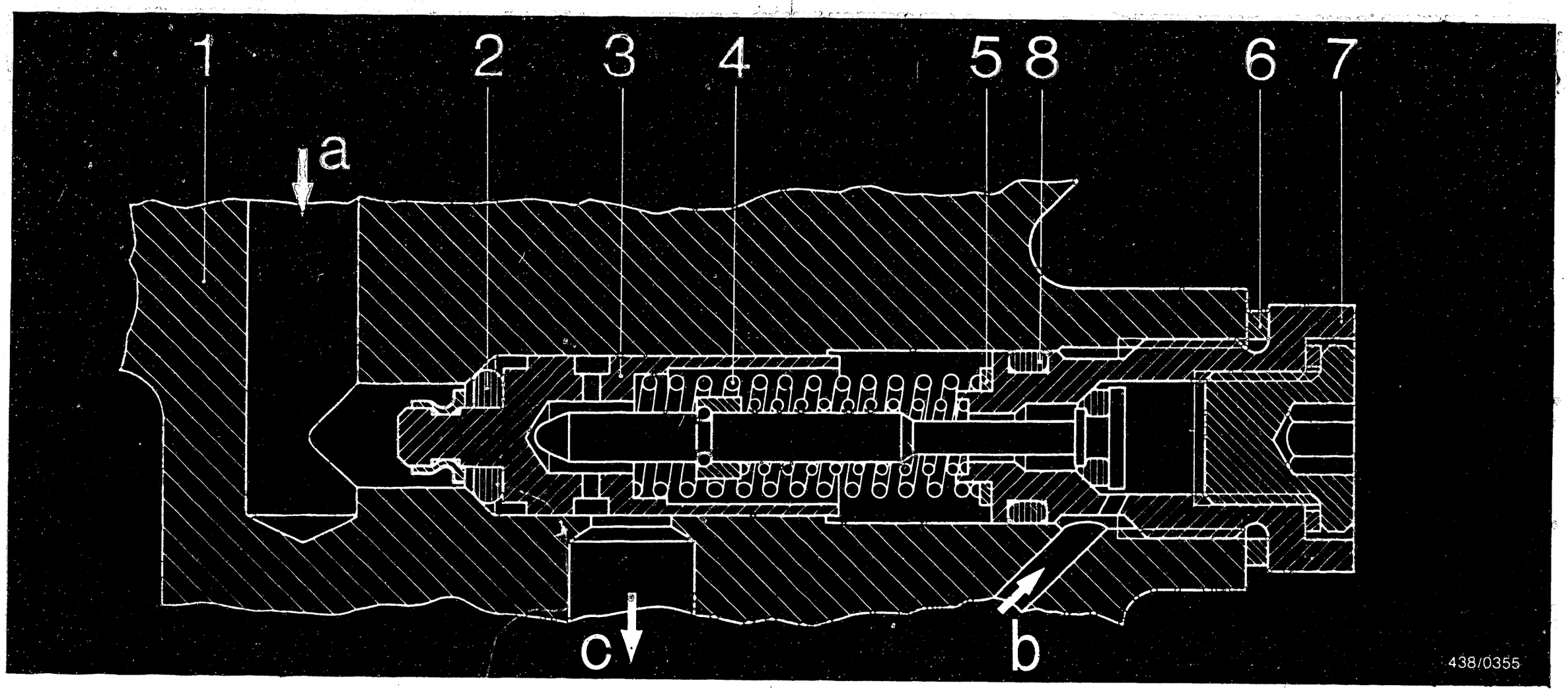
Fuel supply faulty
(Delivery of the electric fuel pump is too low)

Primary pressure set incorrectly
A precondition for readjustment of the primary pressure is always that the fuel supply is OK.
Measure the fuel delivery according to Coordinate C8.

Possible causes for too high a primary pressure:

A restriction in the return line leading to the fuel tank.

Primary-pressure regulator set incorrectly.
For this reason, before readjusting a primary pressure which is too high, always check the condition of the return line leading to the fuel tank first.



a = Primary pressure
b = From warm-up regulator
c = Fuel return
1 = Fuel-distributor housing
2 = Shaped seal ring (formerly O-ring)
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug
8 = O-ring

15.4 Adjusting the primary pressure:

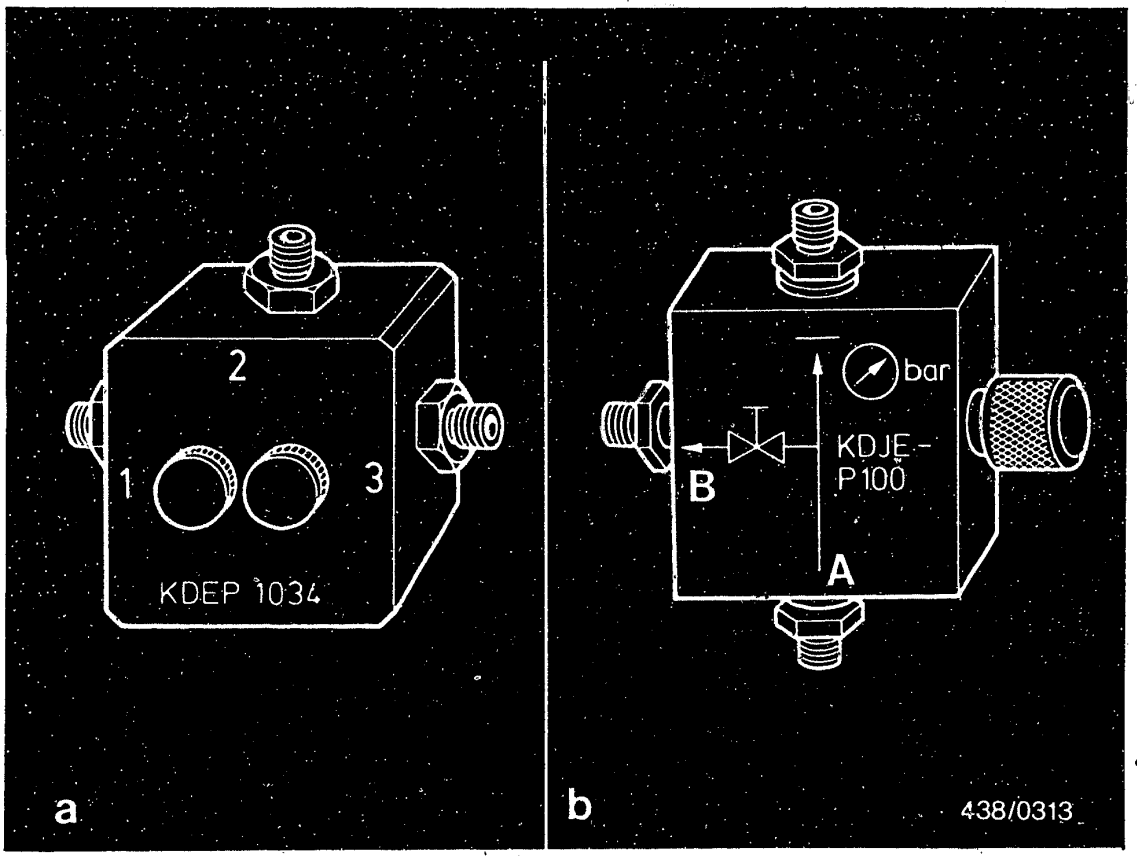
The primary pressure is re-adjusted by replacing the shims (5)
Note:
0.1 mm more shim thickness means about 0.15 bar pressure incresse and vice versa.

To replace shim, screw out the large screw plug (7) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (6) and O-ring (8).

The control piston (3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.

Setting values for primary pressure:

Fuel distributor Part Number	Setting values Primary pressure
0 438 100 040 0 438 100 069 0 438 100 085 0 438 100 099 0 438 100 106	4.9 ... 5.1 bar (5.0 ... 5.2 kgf/cm²)
0 438 100 011 0 438 100 084	5.2 ... 5.4 bar (5.3 ... 5.5 kgf/cm²)



16. Testing the entire fuel system for leaks.

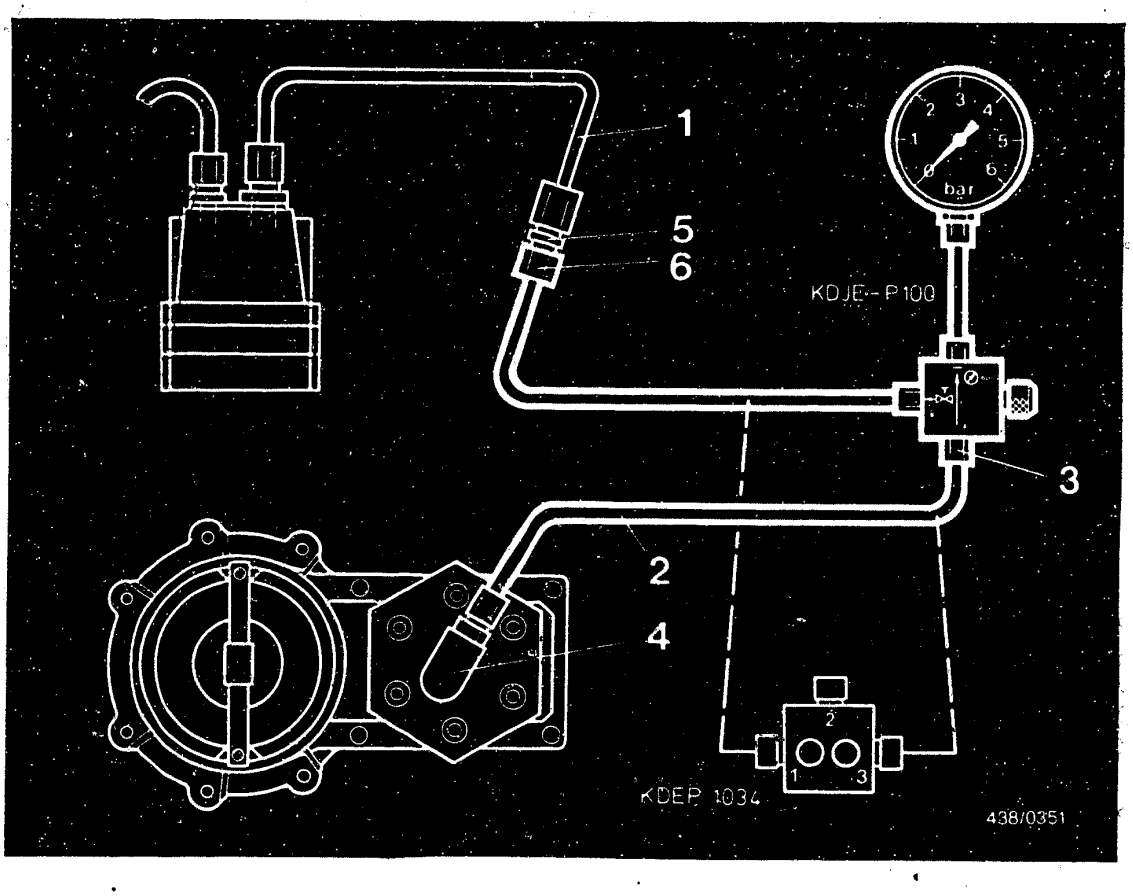
16.1 Mounting the pressure tester KDJE-P100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).

Since the end of 1979 the pressure tester KDJE-P100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



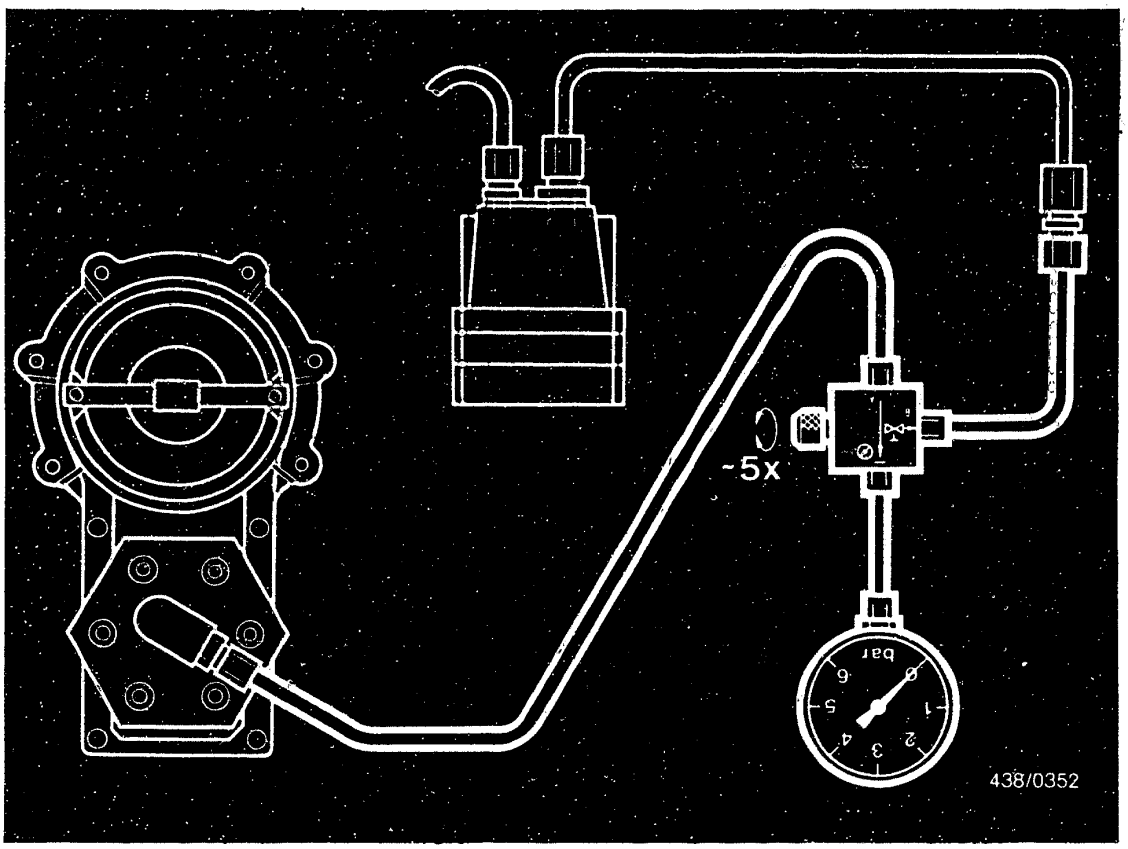
The directional-control valve is connected into the control-pressure line from the fuel distributor to the warm-up regulator:

The connecting-parts set KDJE-P100/11 (formerly KDEP 1034/11) is additionally required.

Unscrew the control-pressure line (1) from the fuel distributor. Connect the connecting hose KDJE-P100/11/1 (2) to the inlet fitting (3) of the directional-control valve and connect to control-pressure connection port (4) of the fuel distributor.

Screw double fitting (5) of the connecting-parts set into hose end (6) of directional-control valve and connect to control-pressure line (1).
Steel tubing of control-pressure line must not be bent!

Hang the pressure gauge from the hood (possibly using wire hook).



16.2 Bleeding the pressure tester

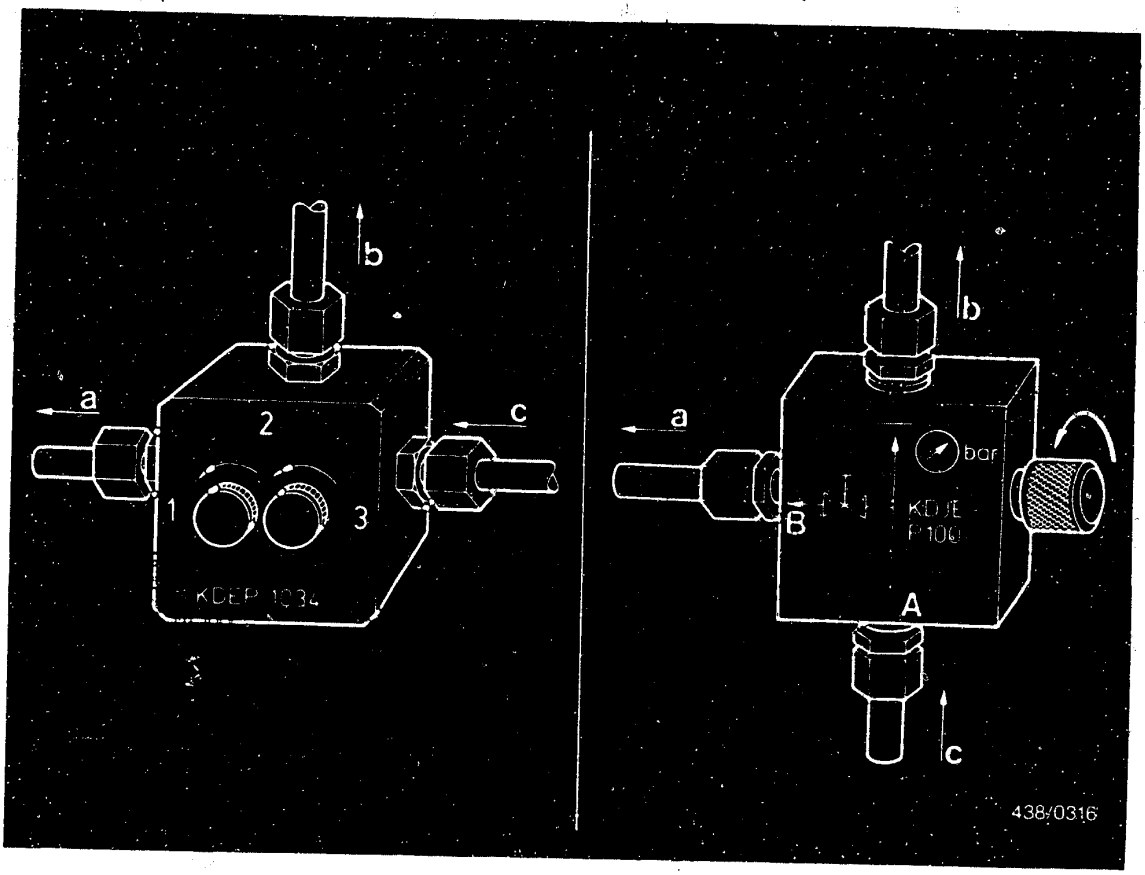
Disconnect the electric plug from the warm-up regulator. Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw(s) of the directional-control valve in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Leak test

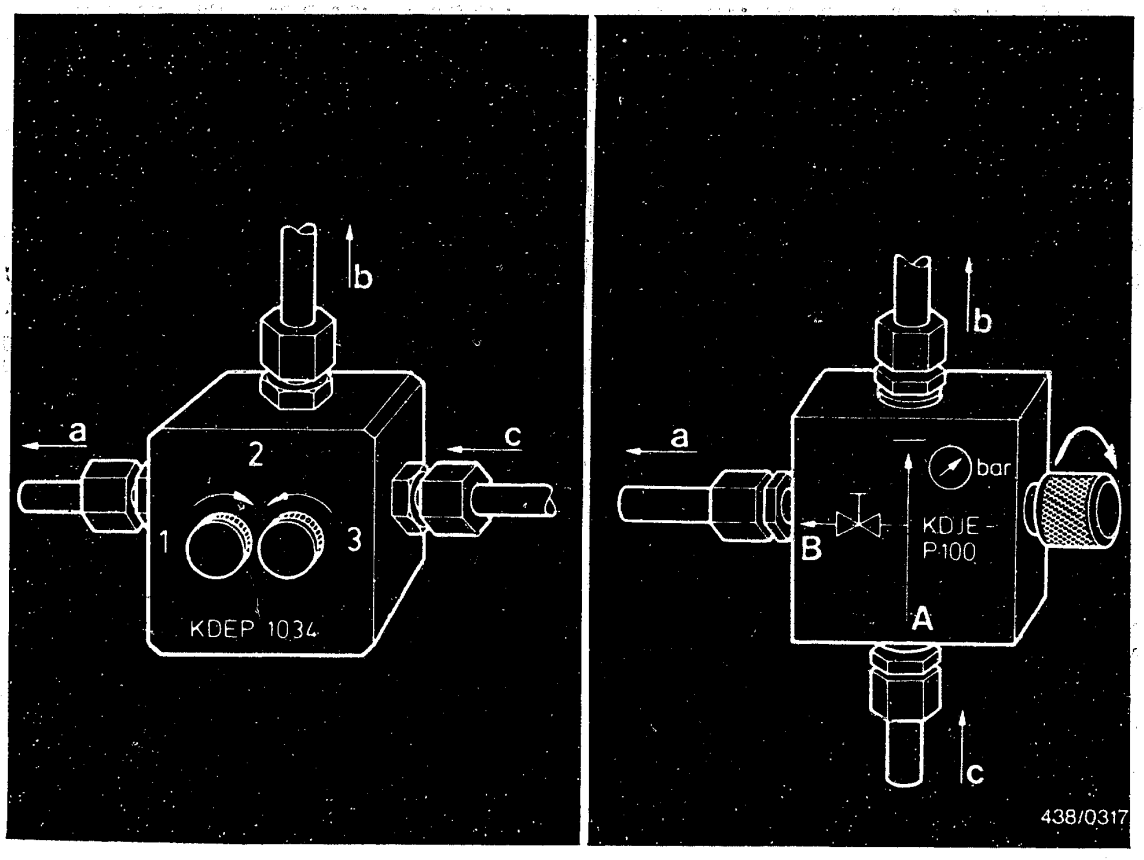
The test is performed with the engine switched off.

Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.
Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).
Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.

Test specifications for leak test:
Minimum pressure after

10 min: 2.7 bar (2.8 kgf/cm²) gauge pressure
20 min: 2.6 bar (2.7 kgf/cm²) gauge pressure



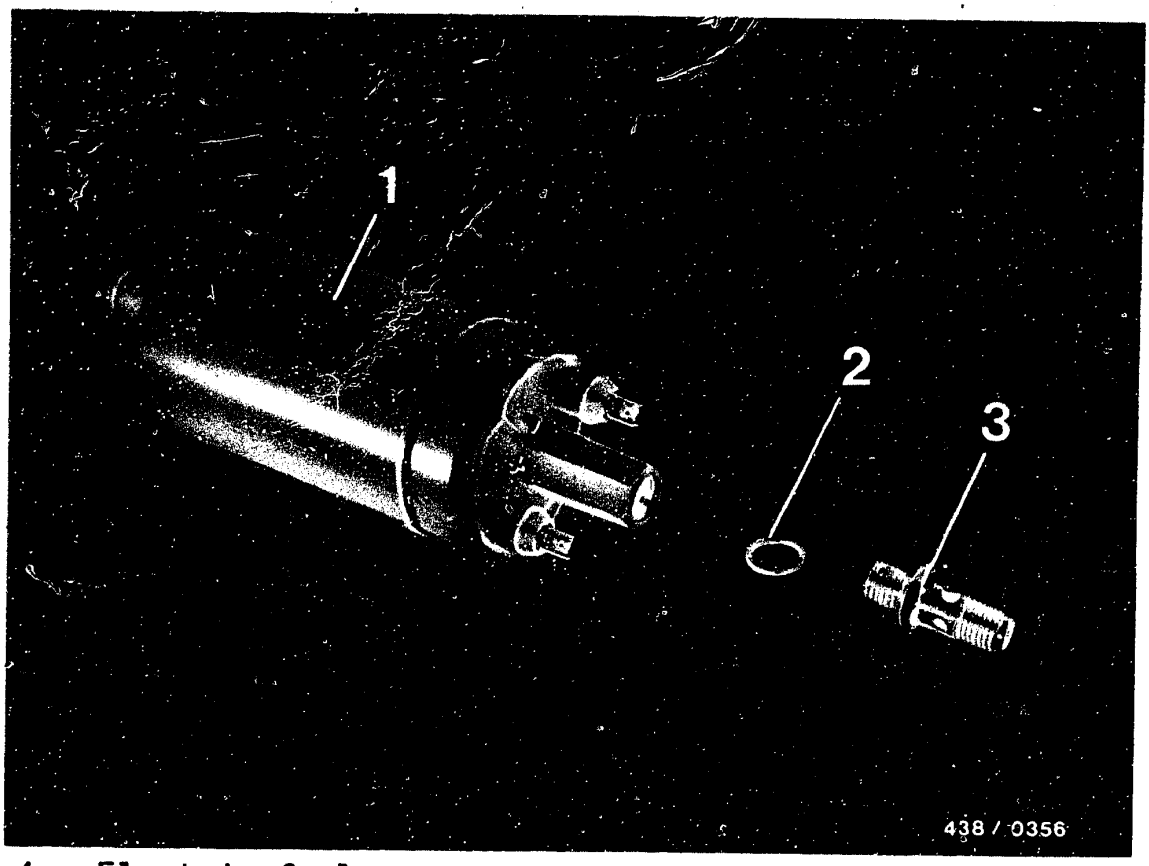
a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.

Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P100.
In the case of KDEP 1034, close valve screw 1, open valve screw 2.

If the same result is found, the leak is in the primary-pressure circuit.

If the test results are correct during the second test, the leak is in the control-pressure circuit.



1 = Electric fuel pump
2 = Flat seal ring
3 = Tube fitting

16.4 Possible causes of a defect in the primary-pressure circuit:

- Non-return valve in the pressure connection piece of the electric fuel pump has a leak.

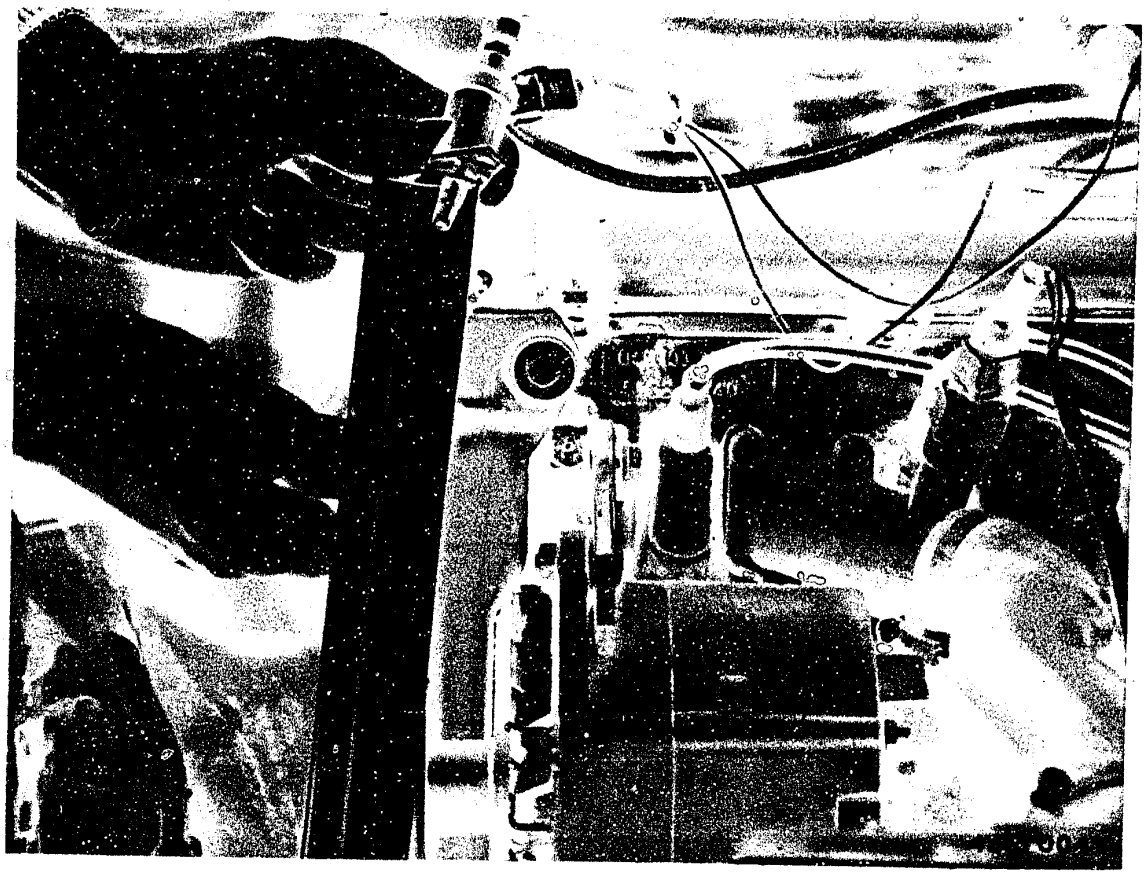
Part No. of electric fuel pump: 0 580 254 973
0 580 254 974

The non-return valve is built into the tube fitting. If necessary, replace the tube fitting (Part Number 1 586 386 016)

Electric fuel pump Part Number 0 580 254 975:

The non-return valve is integrated in the pressure fitting and cannot be replaced.
In order to prevent the complete fuel pump having to be replaced if the non-return valve develops a leak, a parts set with separate non-return valve has been made available. This parts set can be used for this fuel pump
Parts set part number: 1 587 010 003.

Mounting:
Thoroughly clean the pressure-line connection at the electric fuel pump.
Pinch-off the intake hose (from the fuel tank to the electric fuel pump) (e.g. using hose clamper W 157 from Matra Co.). Unscrew the delivery line, collecting any fuel which might escape.
The defective non-return valve remains in the fuel pump.
Screw the short end of the new tube fitting from the parts set, together with thick flat seal ring into the pressure fitting and tighten with a torque of 17 ... 25 Nm.
At the same time, hold the hexagonal section of the pressure fitting with a wrench.
Fit a thin flat seal ring, fuel-line inlet union and another flat seal ring onto the long end of the tube fitting and tighten with the hexagon cap nut.
Remove hose clamper from the intake hose.
Check connections for leaks whilst the fuel pump is running.



● The cold-start valve has a leak.
Remove cold-start valve and connect hose line in place of the steel tubing.

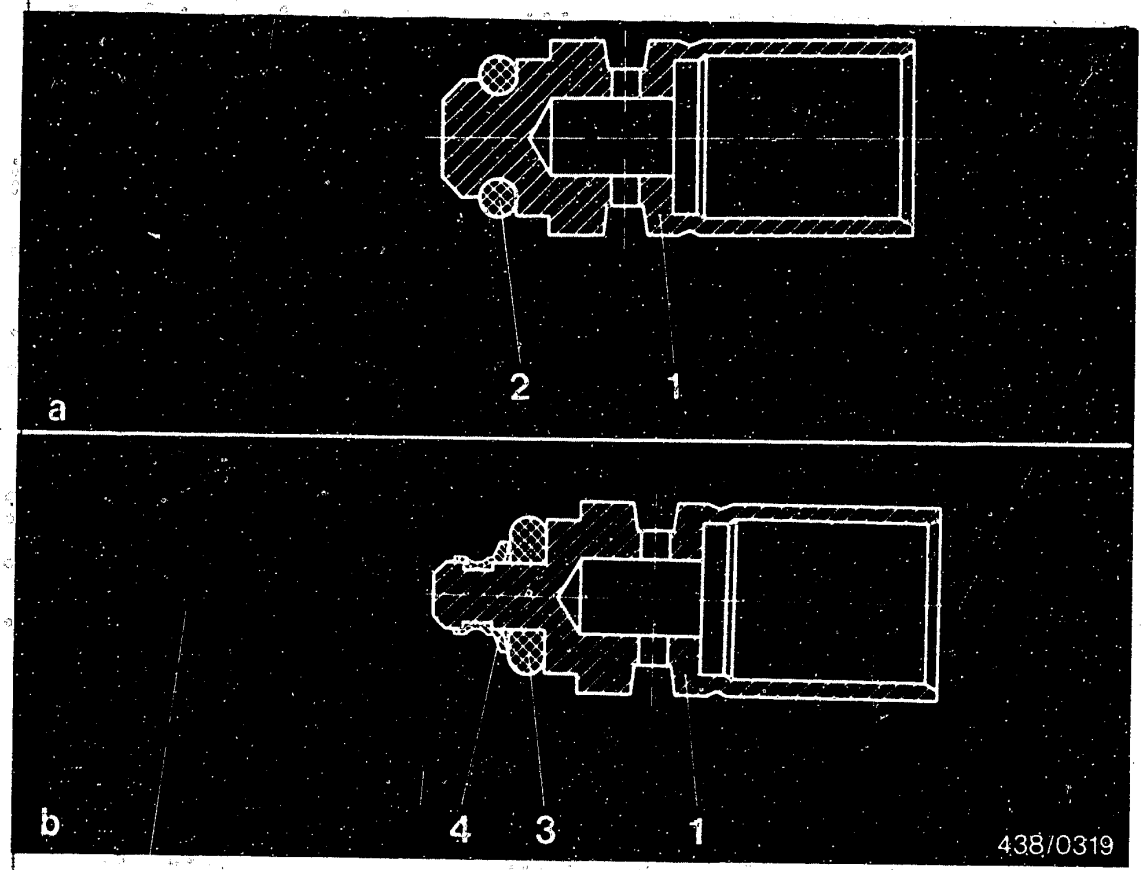
Hold start valve in a suitable container (e.g. graduate).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Dry off the nozzle of the cold-start valve.
No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.

Switch the electric fuel pump off again.

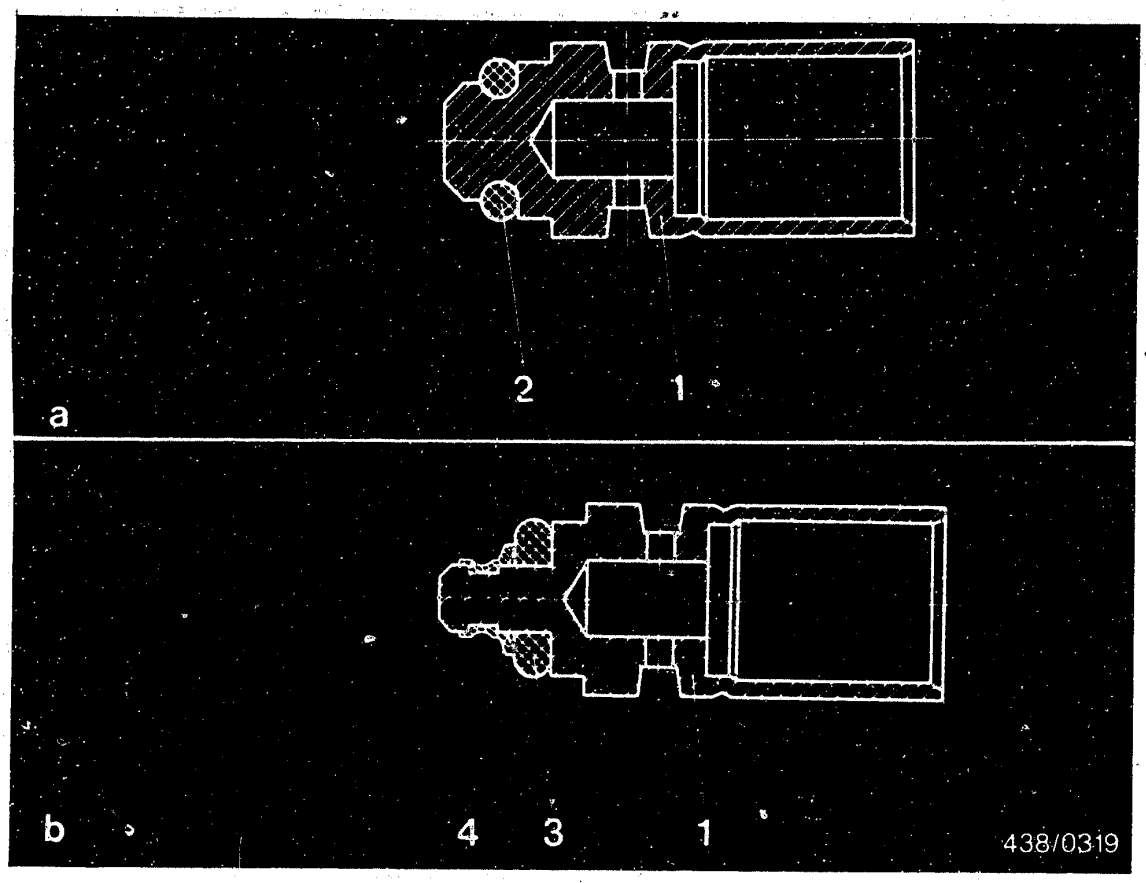
Replace the cold-start valve, if leaky.



1 = Control piston
2 = O-ring
3 = Shaped seal ring
4 = Retaining ring

- Seal ring on control piston of the primary-pressure regulator has a leak.

Replace seal ring:
Clean the fuel distributor in the region of the primary-pressure regulator. Screw out the large screw plug together with the complete push valve. Also remove shims, control spring and control piston.



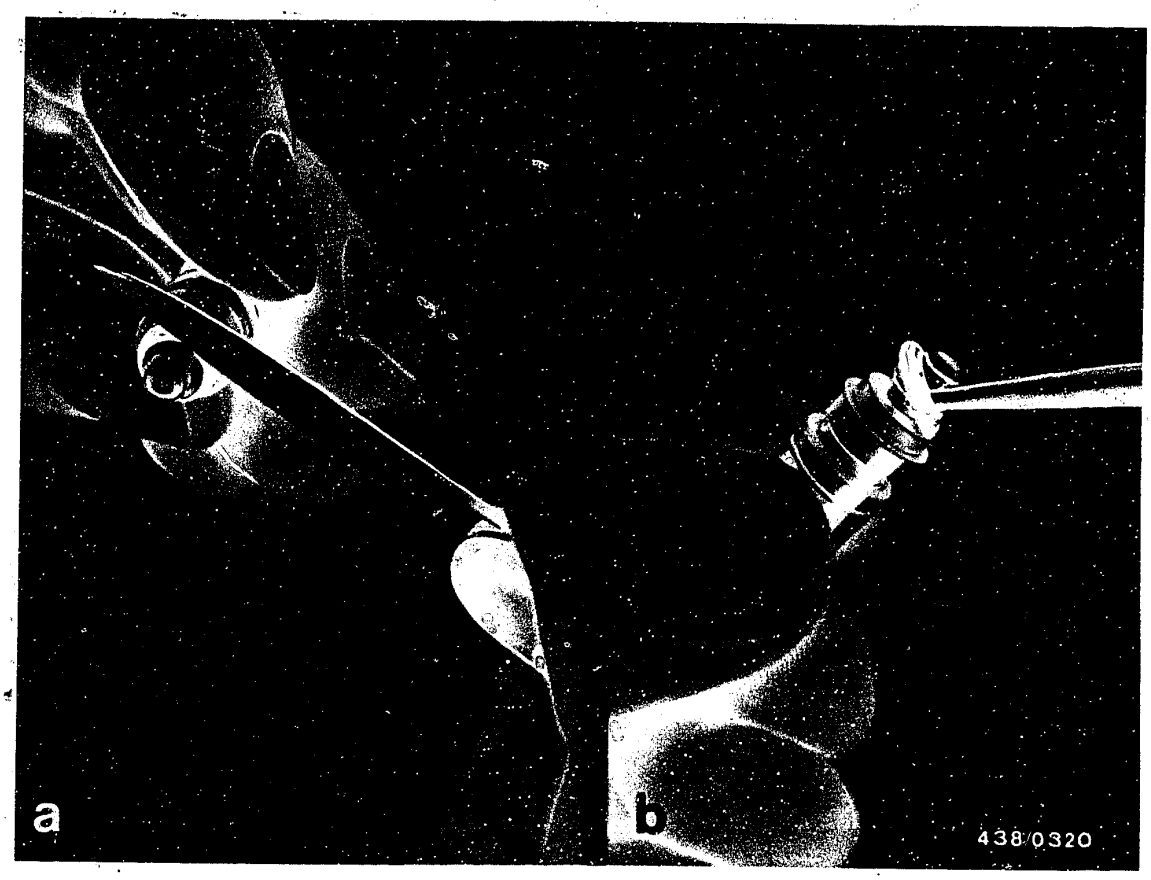
Control piston version with O-ring (Fig. a):

Change O-ring (Item 2).
Fit control piston (Item 1) and control spring.
Screw in screw plug with complete push valve and with shims (as when removed) and new seal rings.

Finally, check the primary pressure and, if necessary, adjust (Coordinates D8-D12)

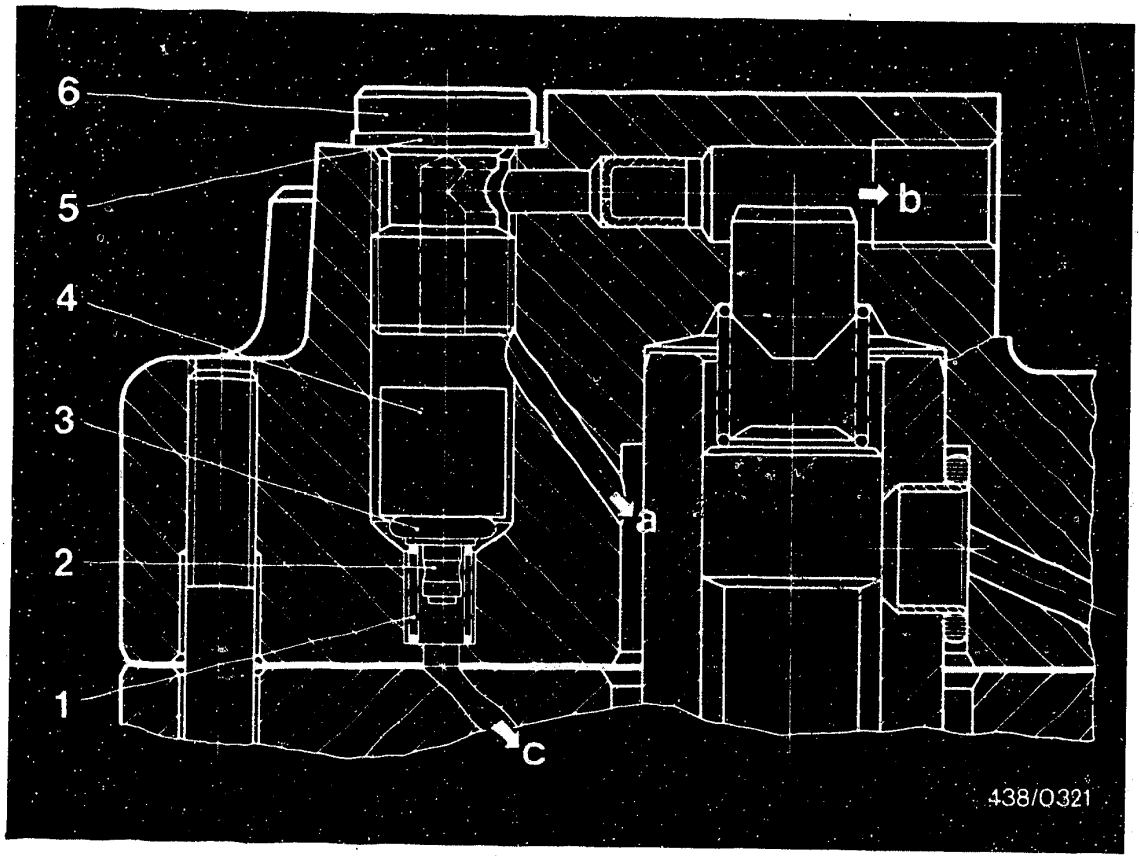
Control piston version with shaped seal ring (Fig. b):

This version employs a specially shaped seal ring (Item 3) which is guided on a cylindrical peg and is held by a caulked retaining ring (Item 4).



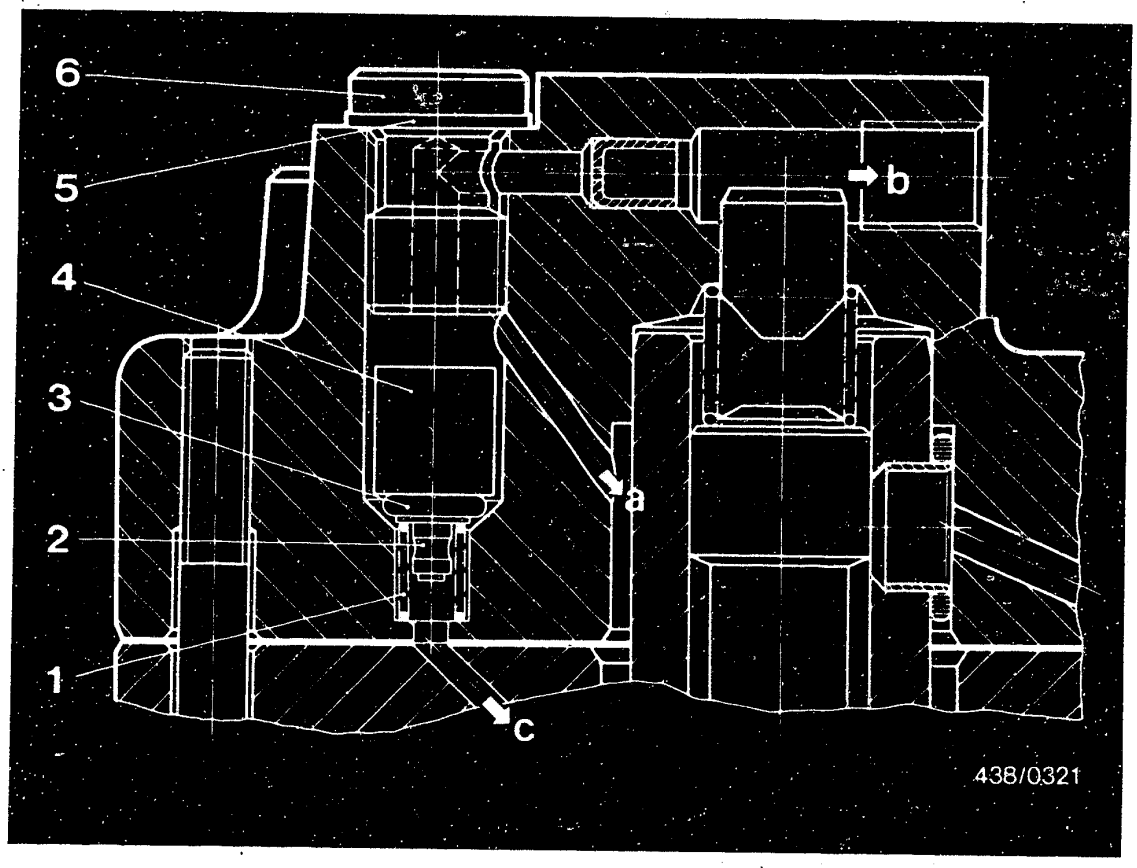
The seal ring is changed without dismantling the retaining ring:
Cut and remove the old seal ring (Fig. a).
Pull the new seal ring over the retaining ring with a blunt marking tool (fig. b). In doing so, do not overstretch the seal ring.
Then you must carefully check to see that the seal ring has been fitted without any damage. It must be possible to turn the retaining ring by hand. There must be a distance of approx. 0.2 mm between the retaining ring and the seal ring.

Finally, check the primary pressure and, if necessary, adjust (Coordinates D8-D12).



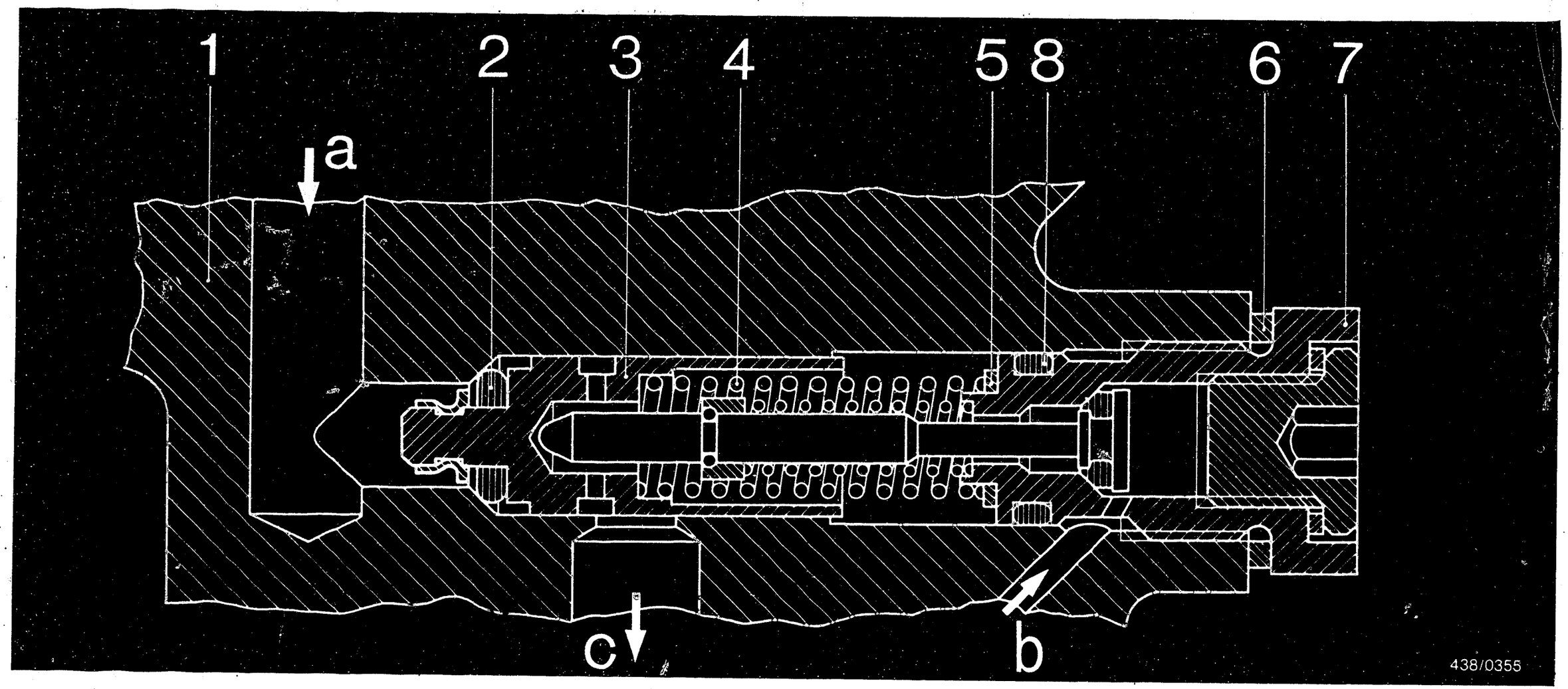
a = Primary pressure
b = Control pressure (to warm-up regulator)
c = Fuel return
1 = Valve spring
2 = Retaining ring
3 = Shaped seal ring
4 = Valve piston
5 = Flat seal ring
6 = Screw plug

● Pressure-relief valve at the control-pressure "tower" of the fuel distributor has a leak.
Replace the complete pressure-relief valve.
The parts set includes all the items from 1 to 6.



a = Primary pressure
b = Control pressure (to warm-up regulator)
c = Fuel return
1 = Valve spring
2 = Retaining ring
3 = Shaped seal ring
4 = Valve piston
5 = Flat seal ring
6 = Screw plug

Clean the fuel distributor in the region of the control-pressure "tower".
Screw out the screw plug using a TORX offset wrench, size TX 730 (commercially available). Remove valve piston and valve spring.
Assemble the parts set:
Fit the valve spring and the partially assembled valve piston and close the bore with the flat seal ring and the screw plug.



a = Primary pressure
b = From warm-up regulator
c = Fuel return

1 = Fuel-distributor housing
2 = Shaped seal ring
3 = Control piston
4 = Control spring
5 = Shim(s)

6 = Flat seal ring
7 = Screw plug
8 = O-ring

16.5 Possible causes of a defect in the control-pressure circuit

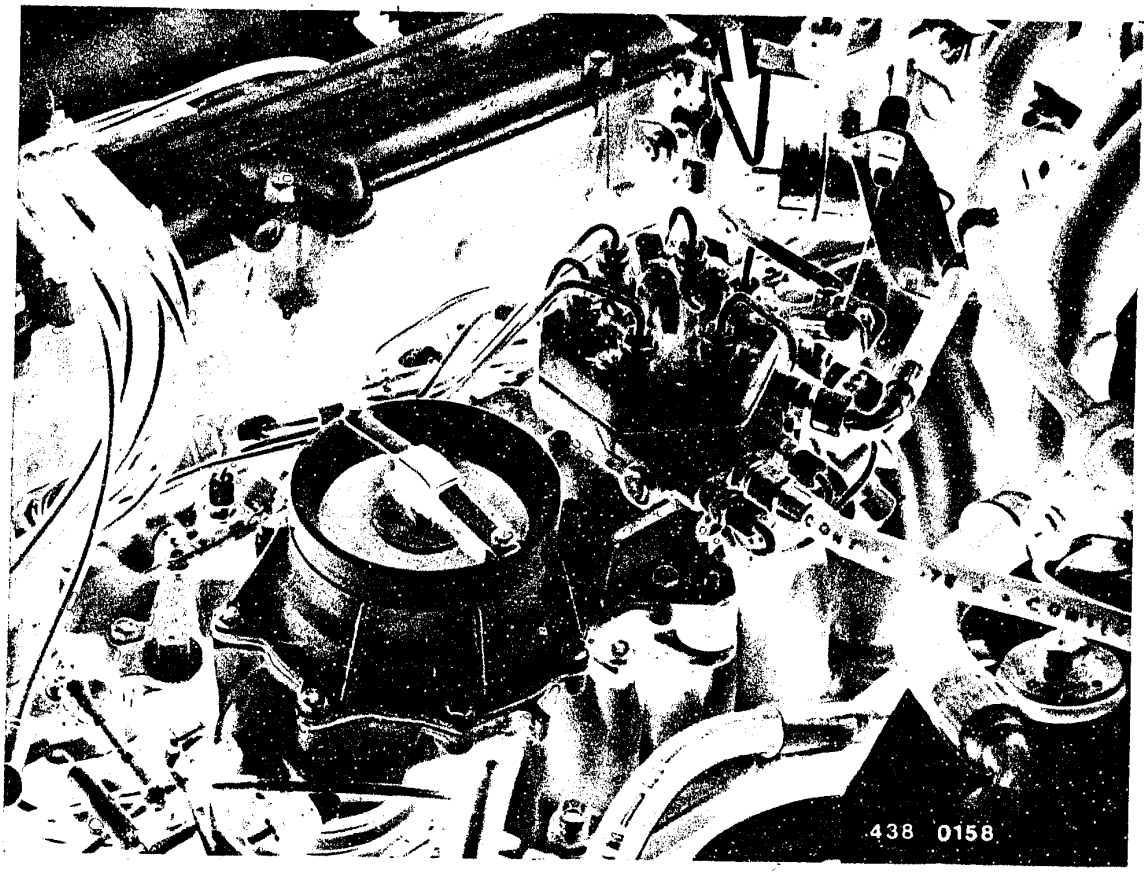
The push valve has a leak

Replacing the push valve:

Due to the fact that the seal ring of the push valve is rigidly vulcanized onto the valve needle, the screw plug (9) must be changed, when necessary, together with the complete push valve (ready-assembled unit).

This also applies for replacement on older versions of the push valve with a loose O-ring on the valve needle.

The O-ring is no longer available. When necessary, therefore, always fit the complete valve unit.



● Fuel-line-pressure damper

A leaking fuel-line-pressure damper can be recognized by pulling off the hose from the leakage-return connection (arrow).

17. Testing the injection valves

Remove the injection valves for testing.
When loosening the fuel lines, apply counter-force at the fixed hexagon of the injection valves.
Caution! Do not bend steel fuel lines!
When refitting the injection valves, it is best to replace the O-rings on the valve stem (Mercedes-Benz service part) in order to prevent leaks and thus the entry of unmetered air.

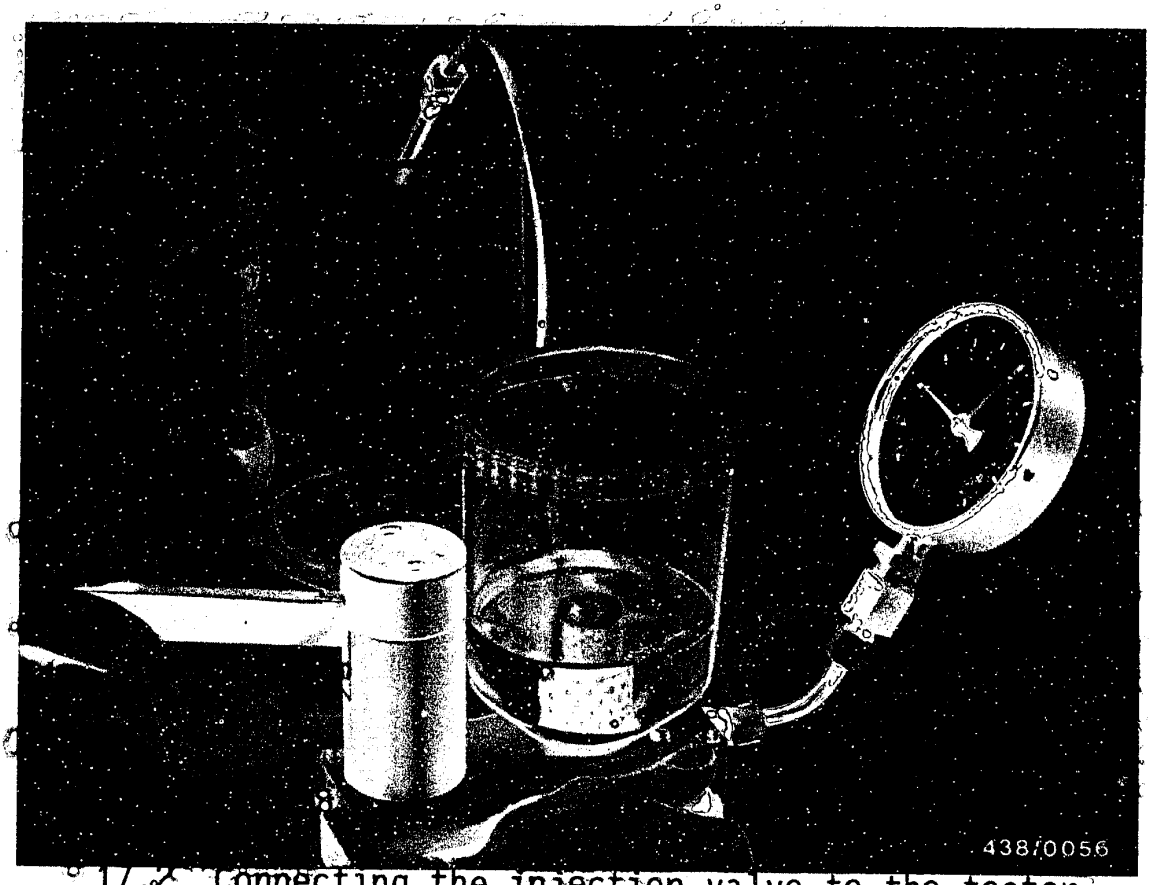
17.1 Test equipment and test media

The following testing specification refers to valve testers KDJE-P400 (previously KDEP 7452) and 0 681 200 700.

Observe the test-media specification!

Test media: Calibrating fluid (Shell K30, Esso-Varsol, Shell Mineral Spirits 135).
or
Bosch Part No. 5 973 340 650
VS 14 942-CH
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:
Firma
Oskar Gnamm GmbH & Co
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.
Even with calibrating fluid, be sure to observe the local official regulations.



17.2 Connecting the injection valve to the tester

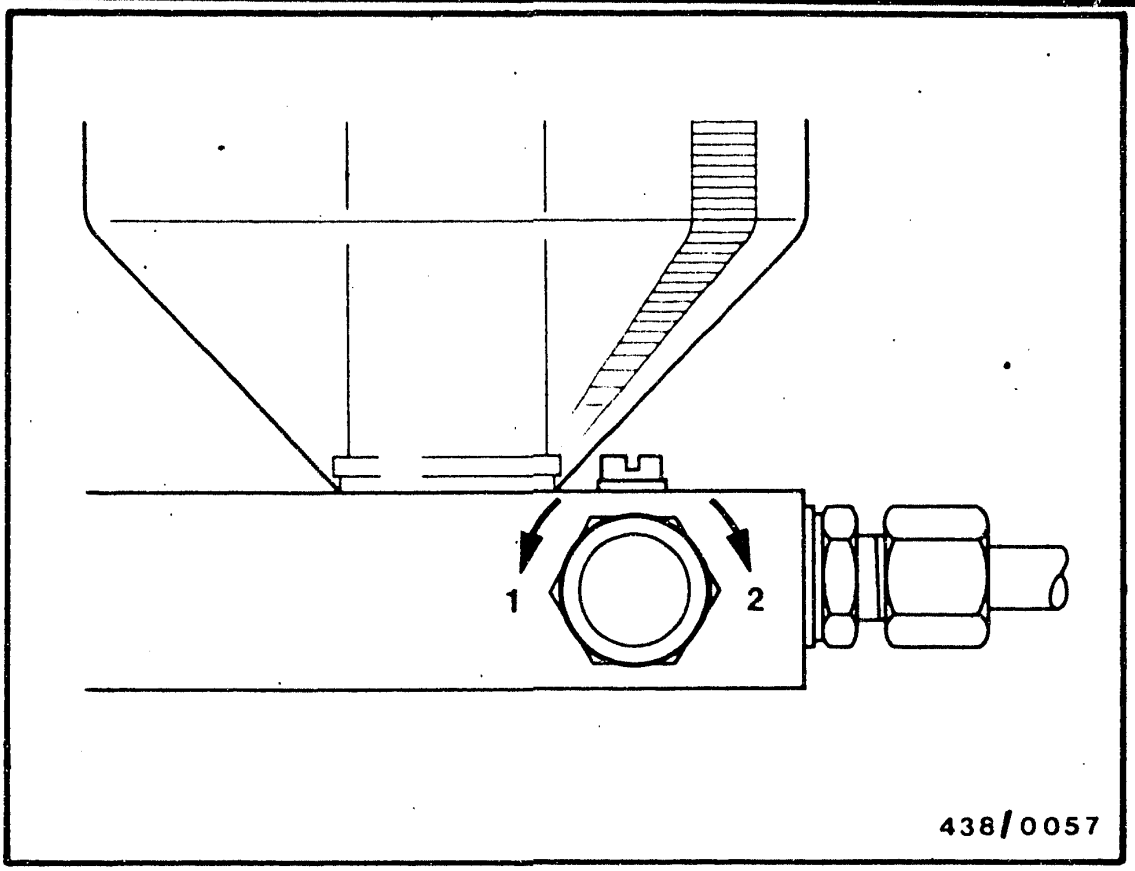
Connect injection valve to valve tester and bleed the discharge tubing by moving the lever back and forth several times with the union nut open. Then tighten the union nut.

17.3 Checking for dirt

Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).

You can try to flush the injection valve clear by moving the lever back and forth several times strongly.

If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.

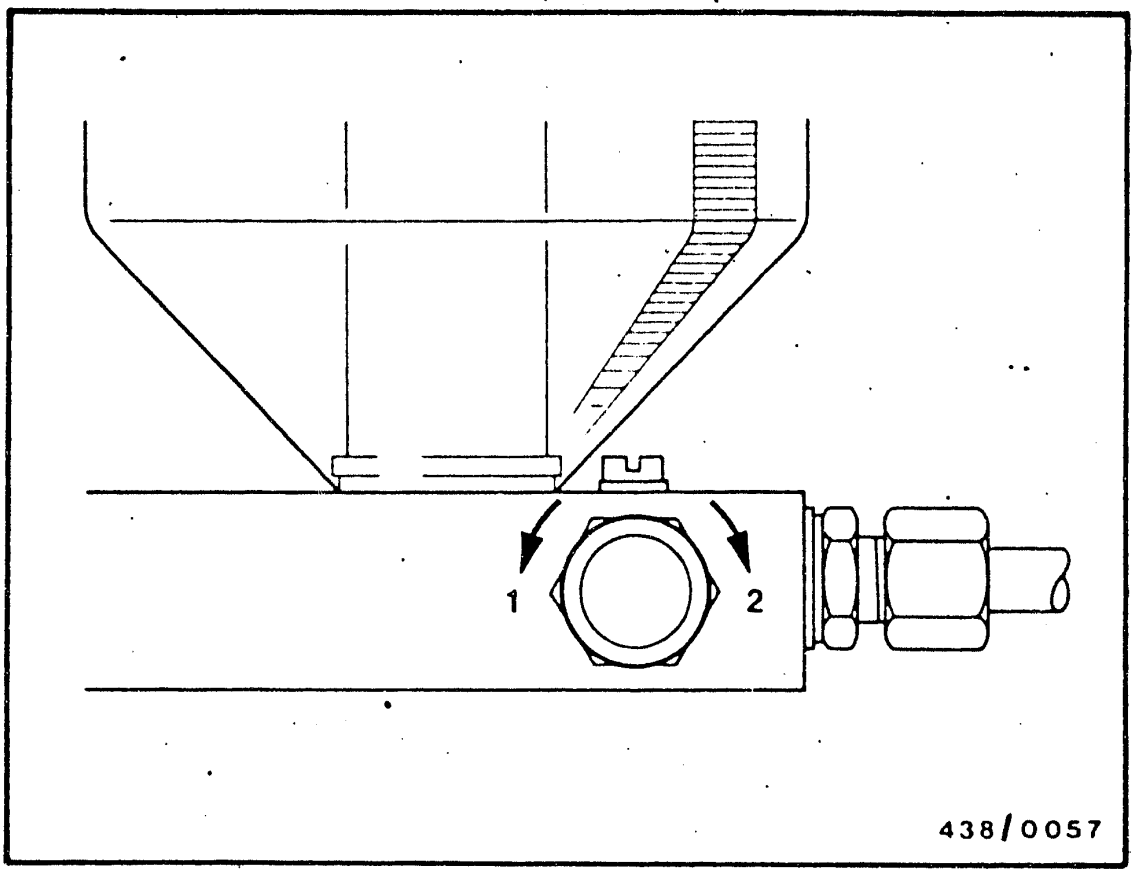


1 — Open
2 — Close

17.4 Testing the opening pressure

Injection valve Part No.	Test specifications - opening pressure
0 437 502 010	3.0 ... 4.1 bar (3.1 ... 4.2 kgf/cm²) gauge pressure

With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke).
If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.

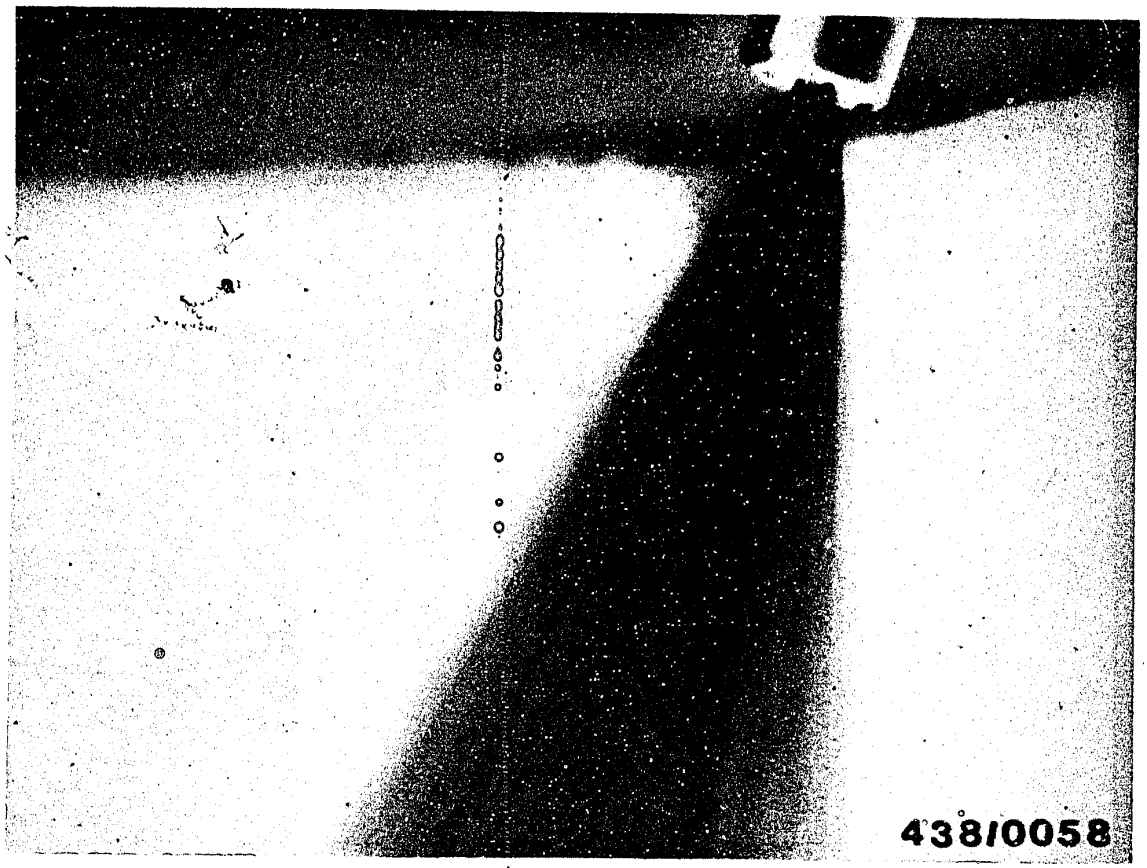


1 = Open

2 = Closed

17.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.8 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 15 seconds.



17.6 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35° is permissible (see example given in illustrations).

Illustration shows good spray formation.

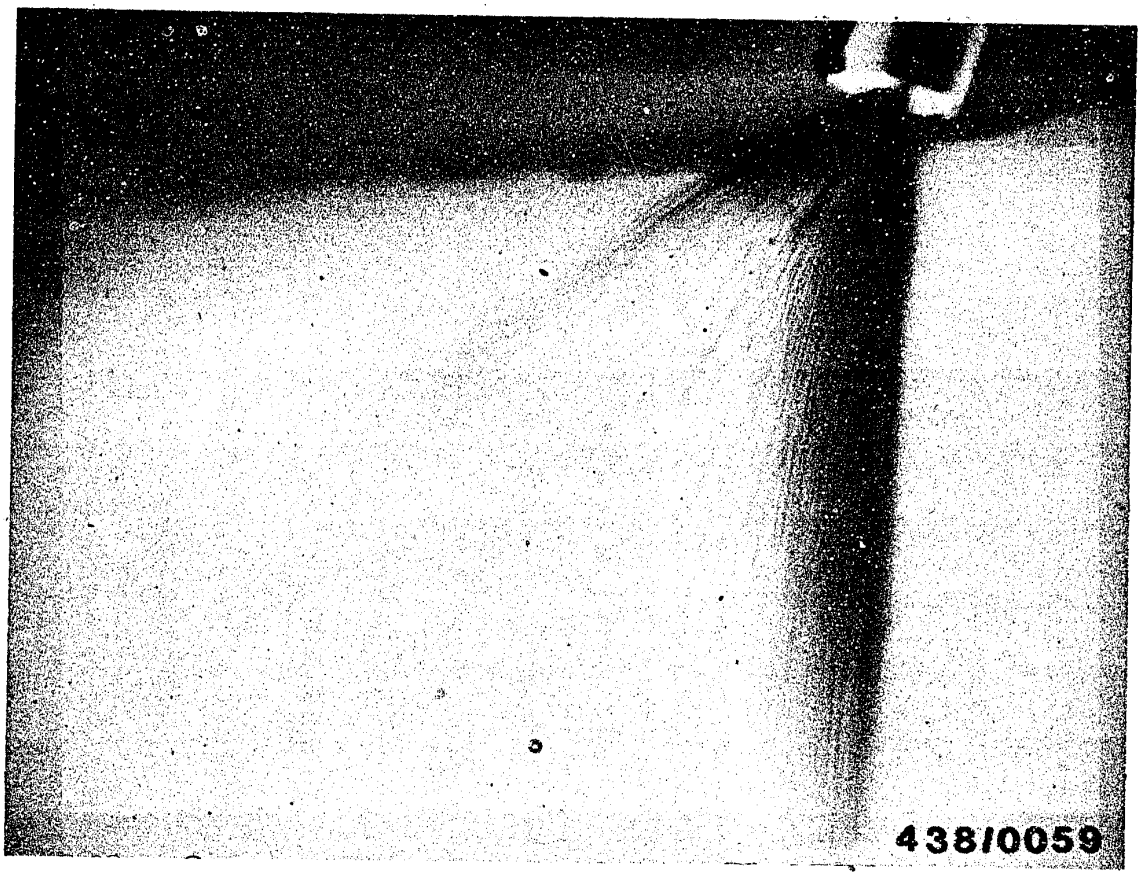
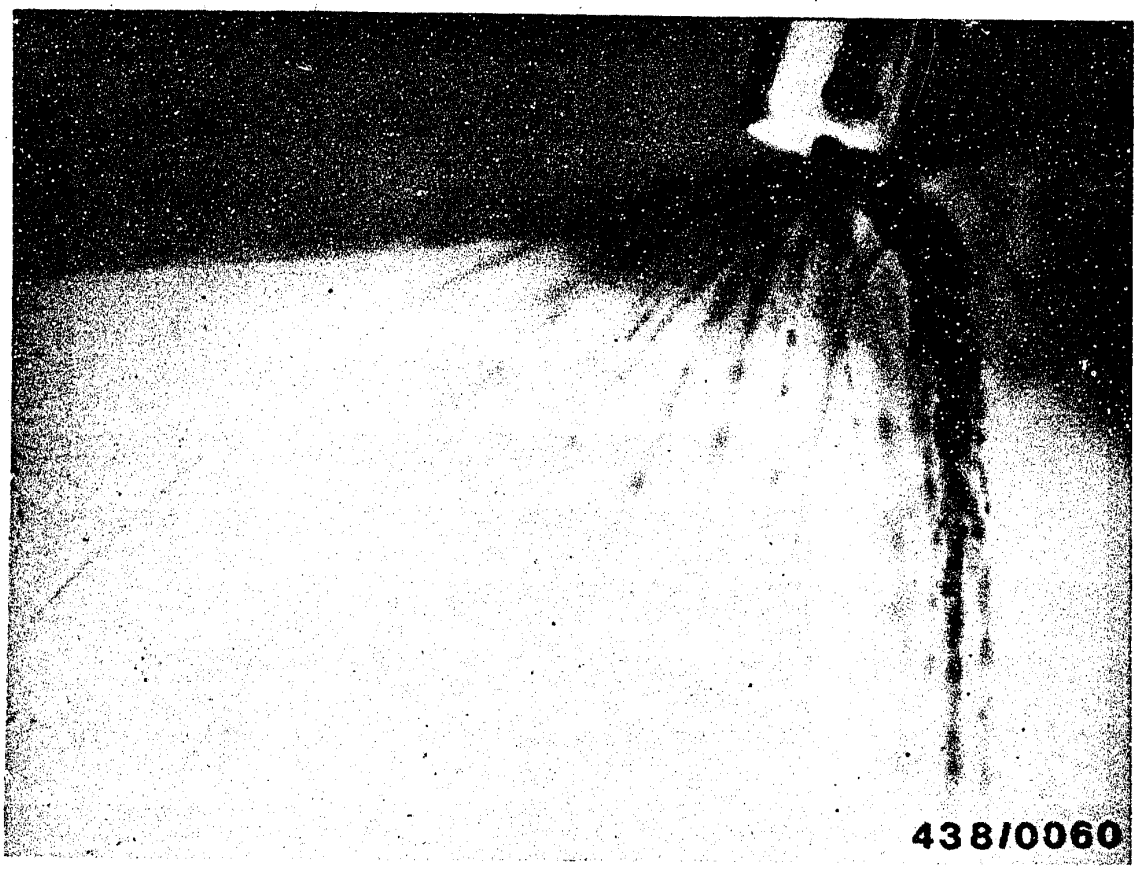
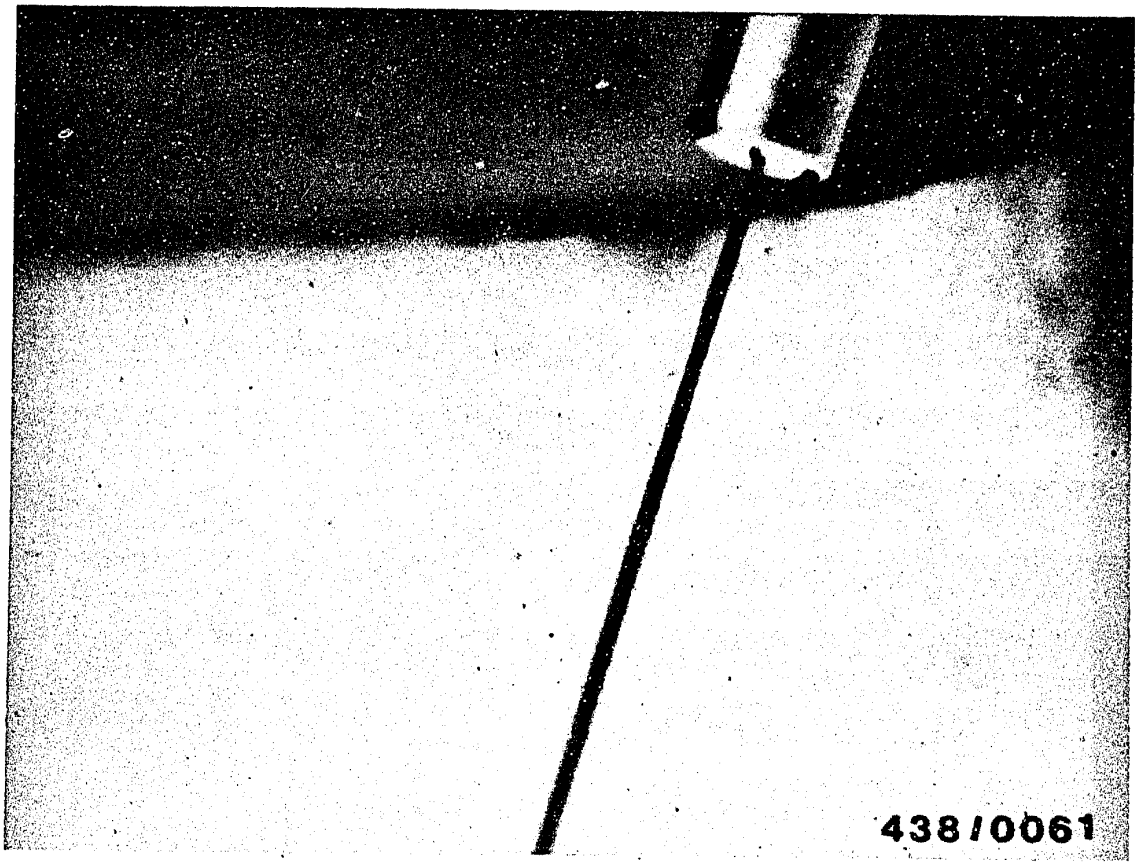


Illustration shows single-sided but nevertheless good spray formation.



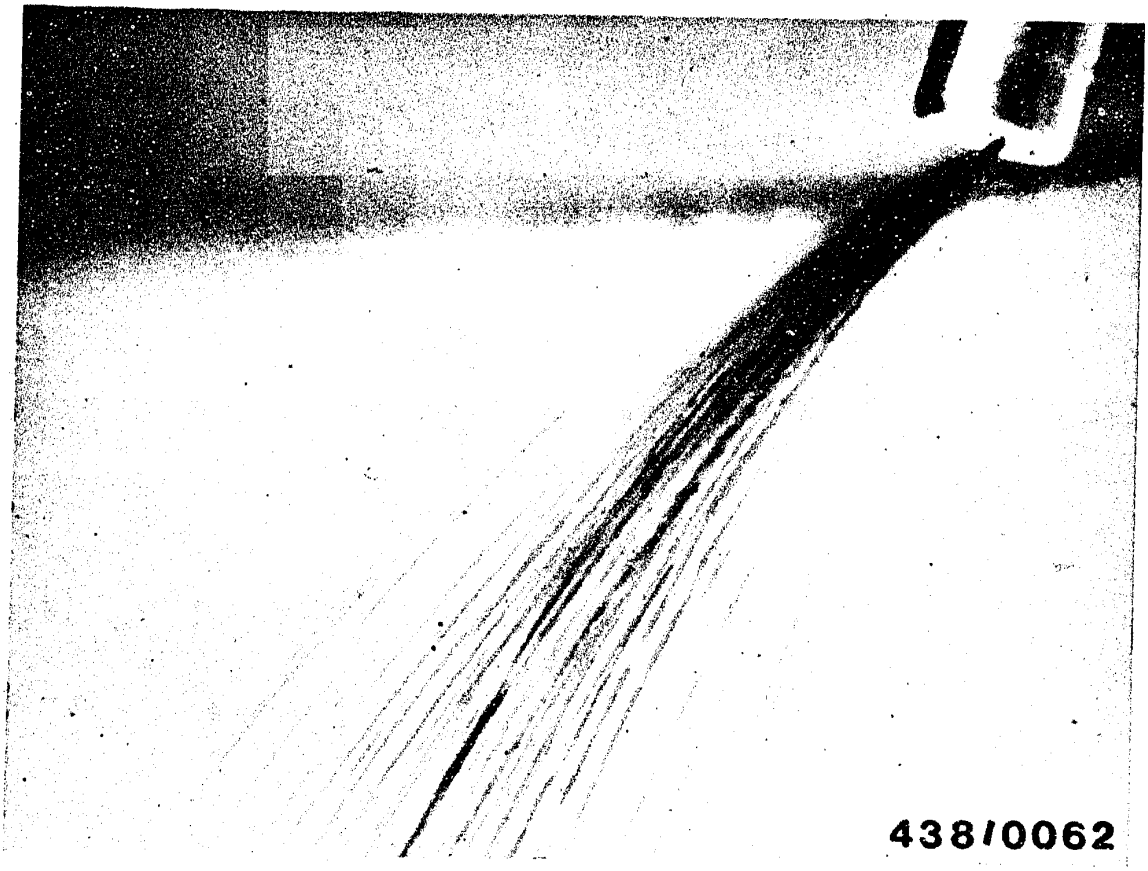
Poor spray formation; replace injection valves.

Illustration shows drop formation.



Poor spray formation; replace injection valves.

Illustration shows "cord" spray.

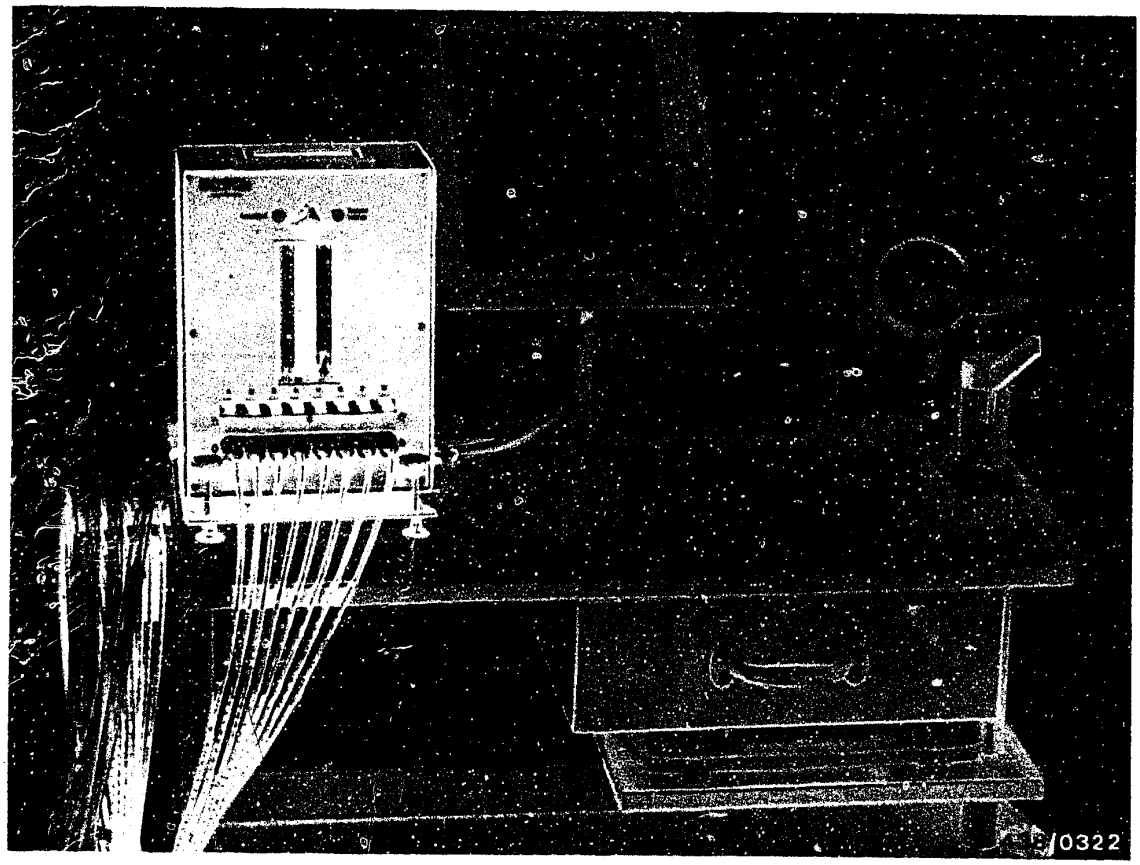


Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

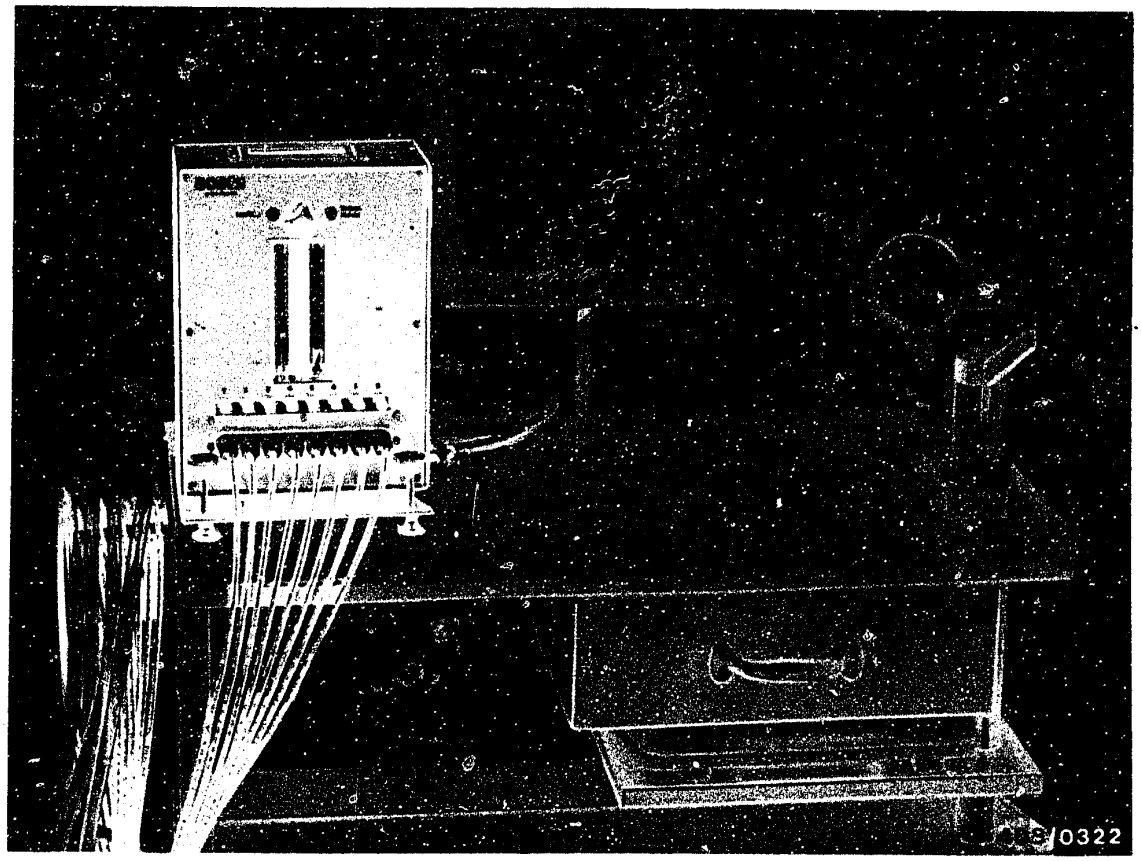
If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F13-F19.



18. Comparative measurement of fuel delivery of fuel distributor outlets.

This test is carried out using the tester for delivered quantity comparison KDJE-P200 (previously KDJE 7451).

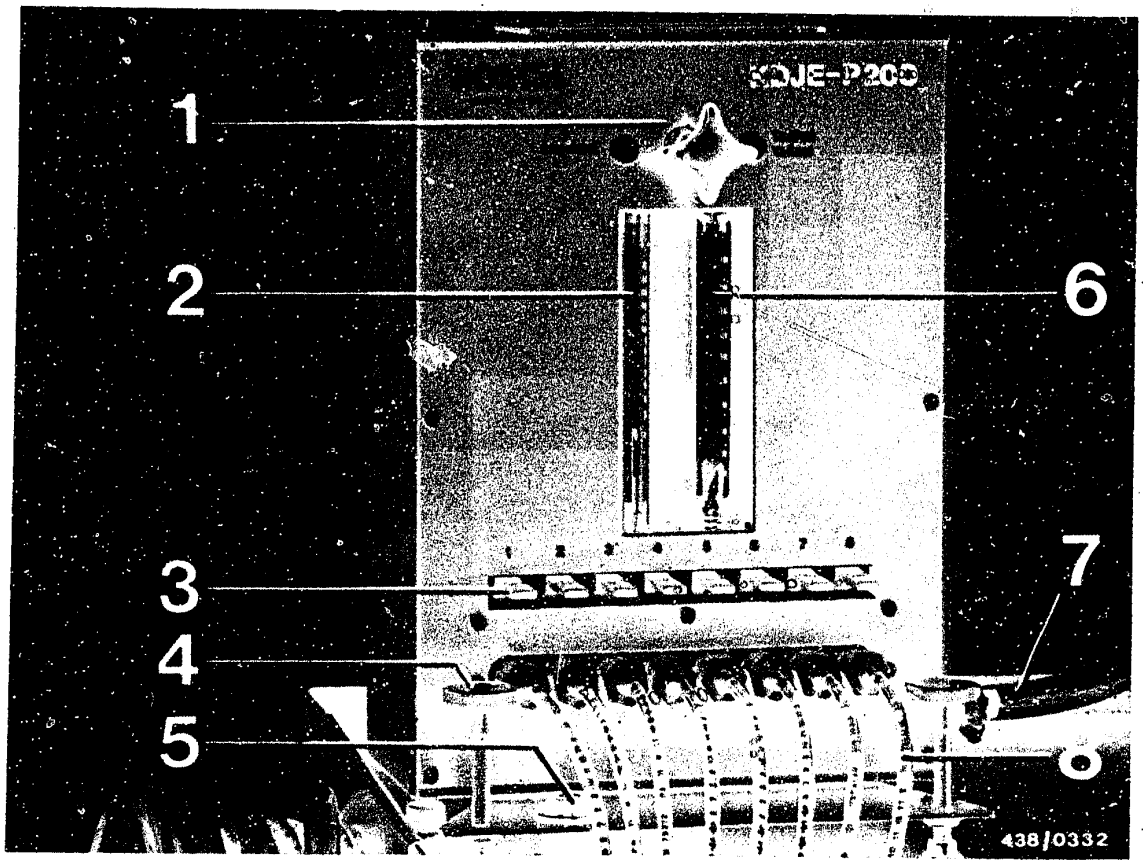


18.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.

The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.

Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Hose lines
8 = Return hose

18.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

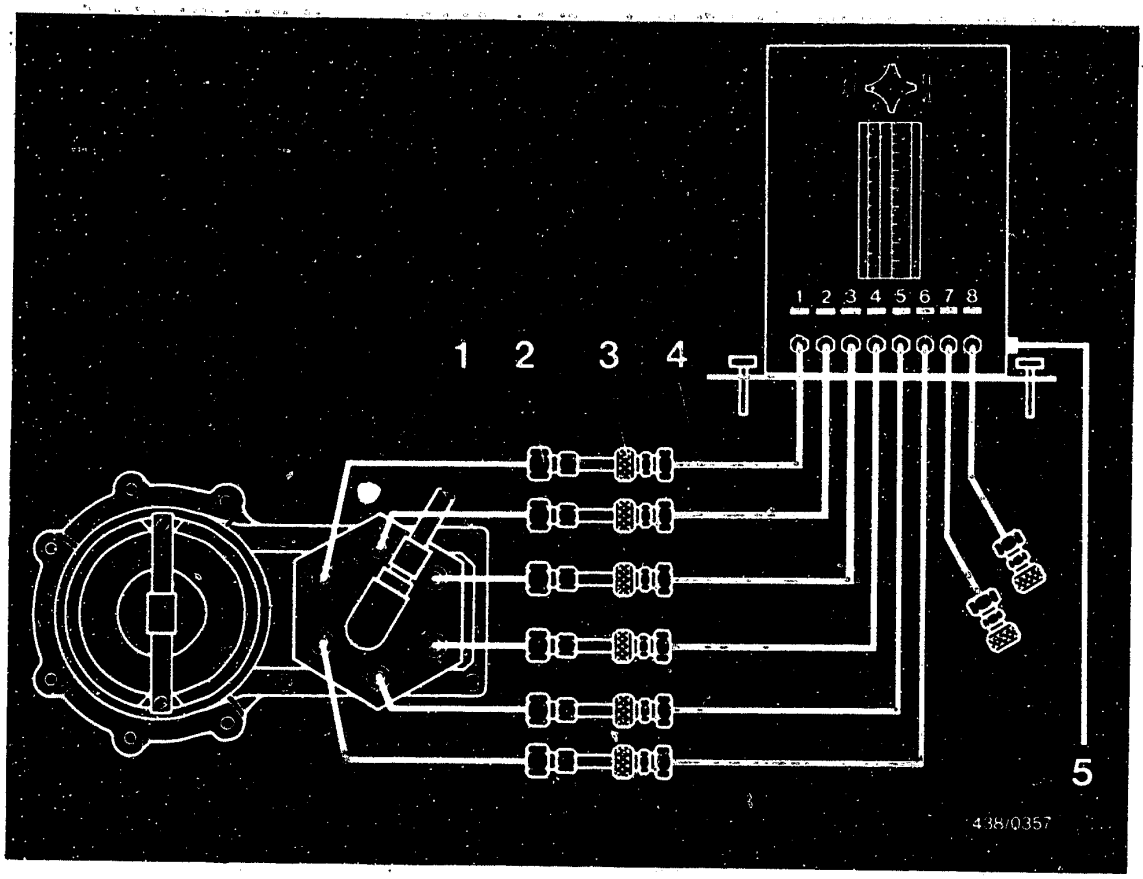
Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.



1 = Adapter connection hoses from line set KDJE-P200/25
2 = Injection valves
3 = Automatic connectors
4 = Tester hoses
5 = Return line to fuel tank filler neck

18.3 Setting up and connecting the tester:

Set the tester up beside the engine on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level at the base of the tester.

So that the rigid fuel-injection tubing is not bent too much, the tester for delivered quantity comparison is connected using the adapter connection hoses KDJE-P200/25.

Remove the injection valves completely.

Unscrew the fuel-injection tubing from the fuel distributor and connect the adapter connection hoses instead.

Screw the injection valves onto the adapter connection hoses.

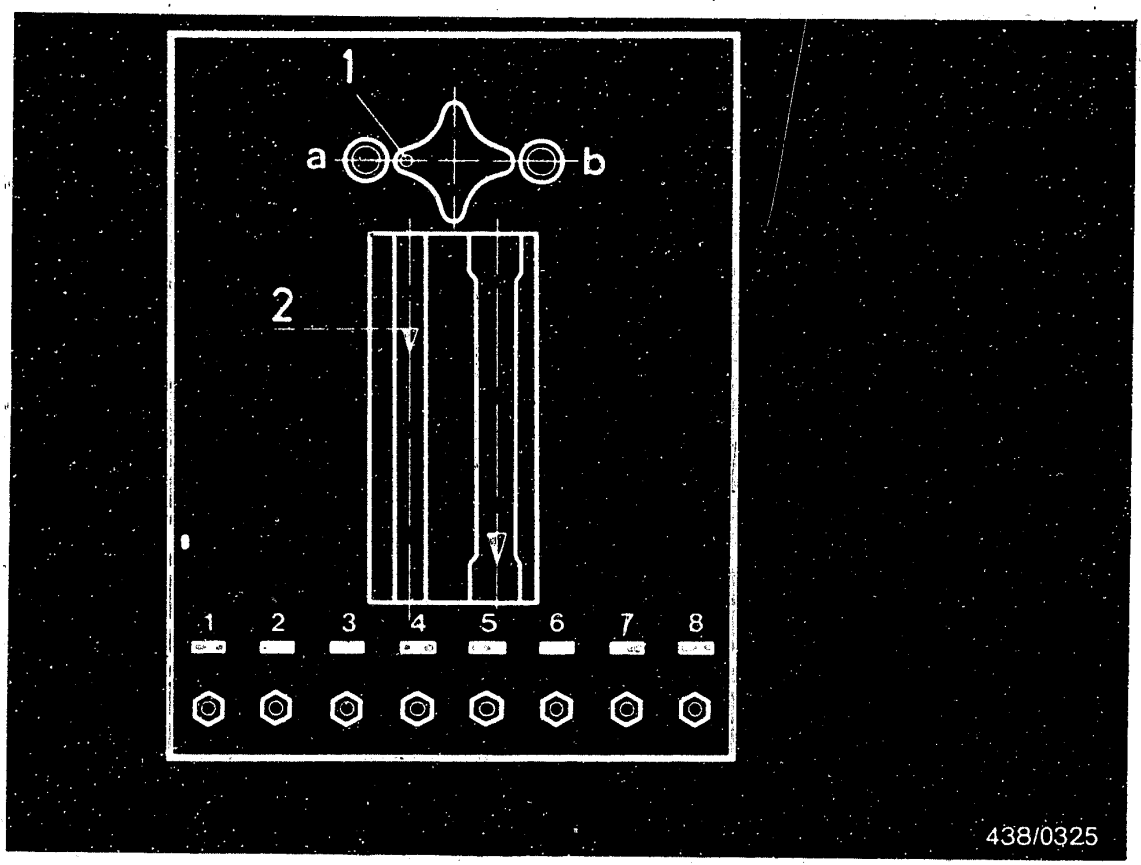
Clean the injection valves with a rag and insert injection valves into the automatic connectors of the first six tester hoses.

Note:
Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are opened fully.

Introduce the return hose of the tester into the fuel tank filler neck.

18.4 Bleeding the tester:

Remove the air filter so that the air-flow sensor plate becomes accessible.
Remove the electric plugs from the warm-up regulator and the auxiliary-air device.
Switch on the electric fuel pump by bridging the electrical safety circuit.
Press down the air-flow sensor plate to the stop.
Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.
Return the sensor plate to the rest position.

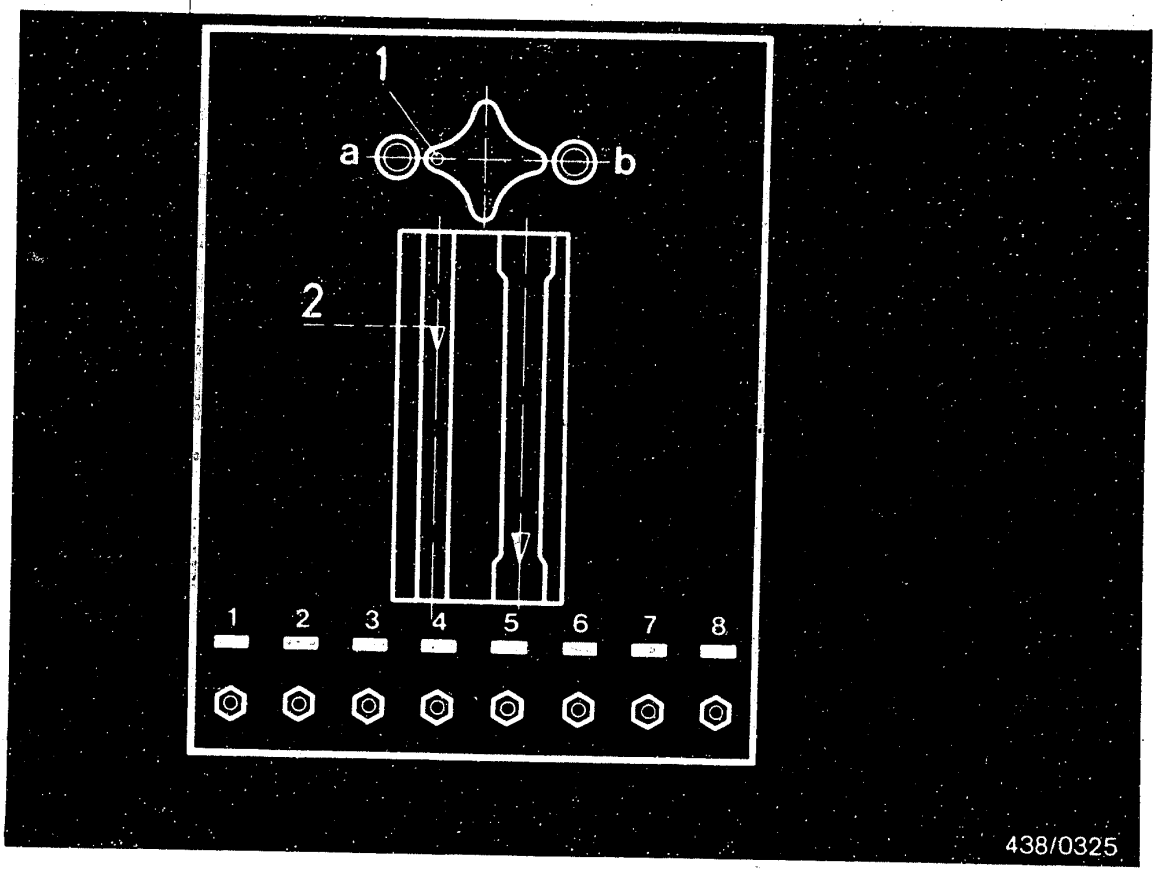


a = Idle
b = Part load/full load
1 = White point
2 = Measuring line

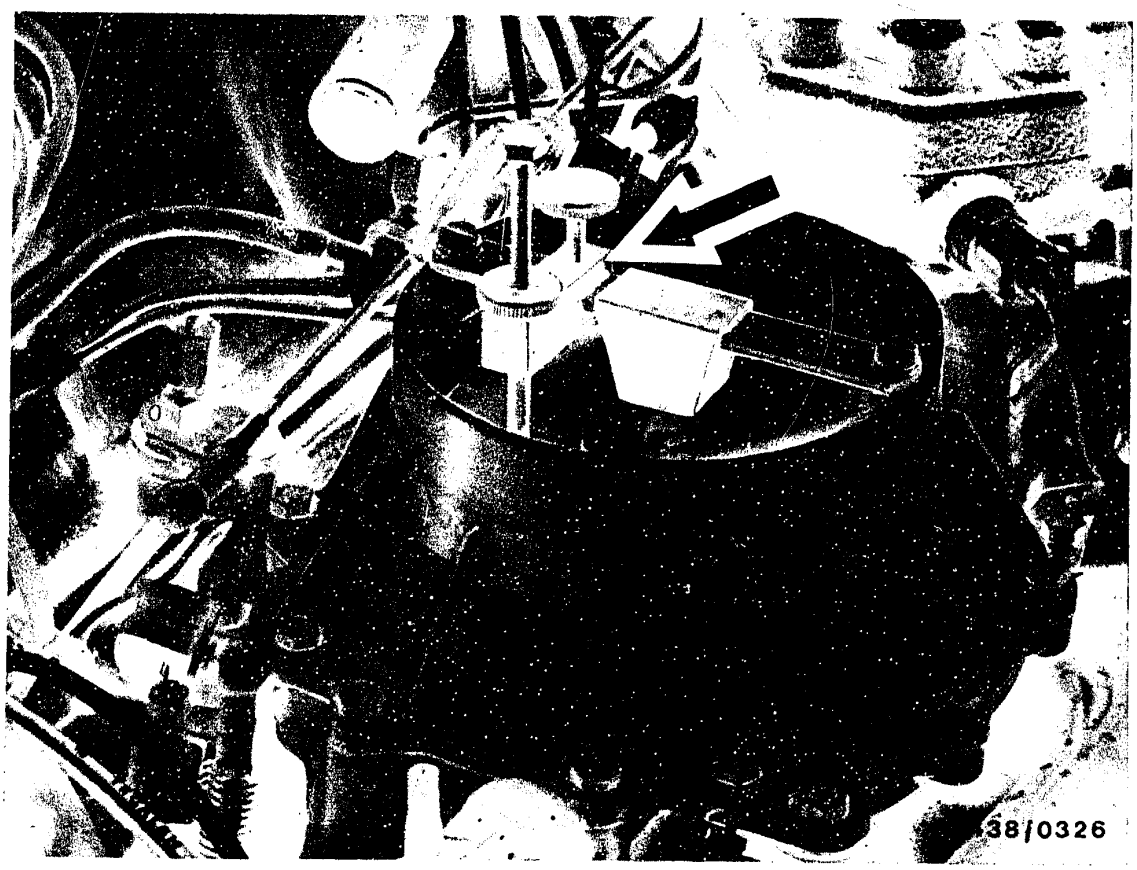
18.5 Testing:

The flow comparison measurement is made in the idle, part-load and full-load ranges.

The small rotameter tube is to be used for the idle measurement (white point to left on control knob); part-load and full-load measurements are made using the large rotameter tube (white point to right).



The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2).
On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20...30 seconds in the case of small deliveries.



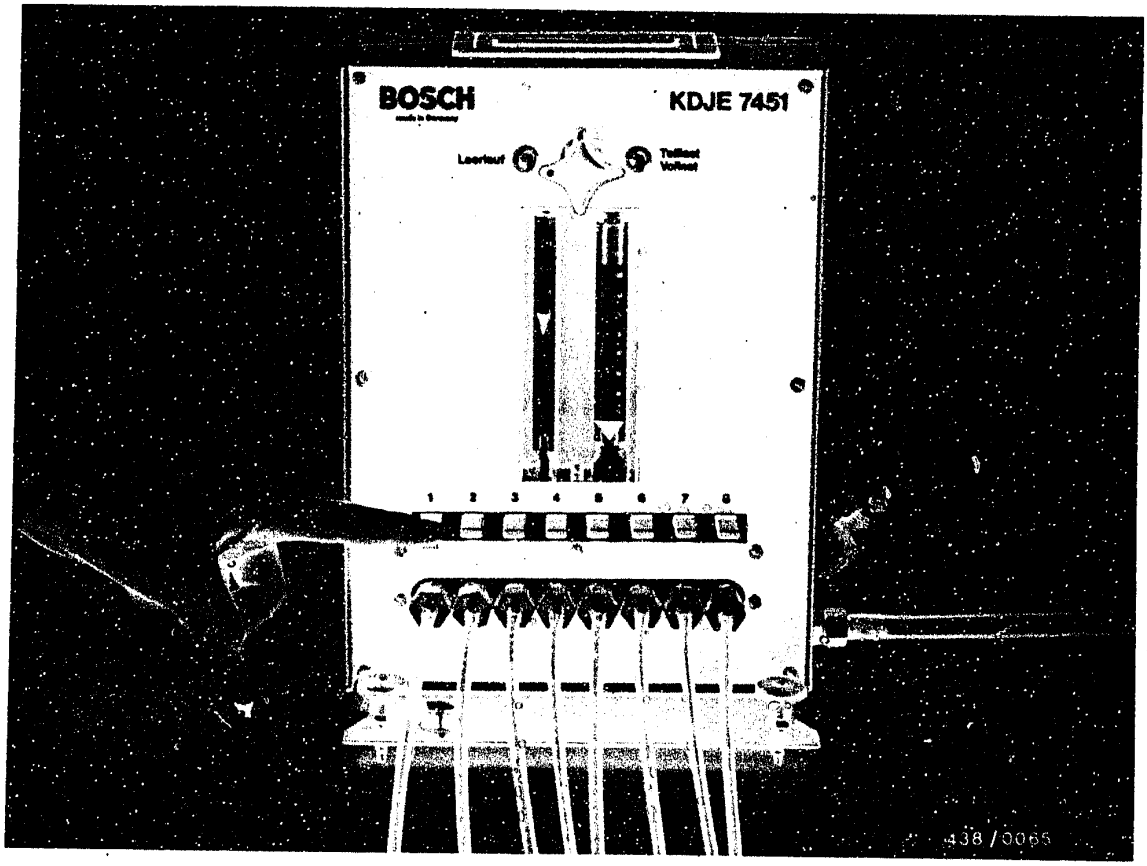
The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using the setting device KDJE 7456.

With the adjusting screw initially screwed all the way out, the setting device is clamped onto the stop bracket of the air funnel (arrow).
Adjust the position of the air-flow sensor plate using the adjusting screw.

Procedure:

Switch on the electric fuel pump by bridging the electrical safety circuit.
Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.

The "set point" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

18.6 Test specifications

	Set point cm³/min	Maximum permissible fuel delivery cm³/min
Idle	6,0	6,8
Part load	30,0	34,0
Full load	100,0	110,0

18.7 Final operations

Re-fit the injection valves correctly.
Also fit the air filter. Make sure that all lines are routed correctly.

Re-connect the electrical safety circuit of the K-Jetronic correctly.

If, after repeated measurements, in one of the 3 load ranges, a wider scatter is found than allowed by the test specifications, the fuel distributor must be replaced.

Finally, it is necessary to adjust the idle speed with the engine at its normal operating temperature.

Idle-speed adjustment is described on Coordinates F13-F19.

19. Idle-speed adjustment

19.1 Test conditions:

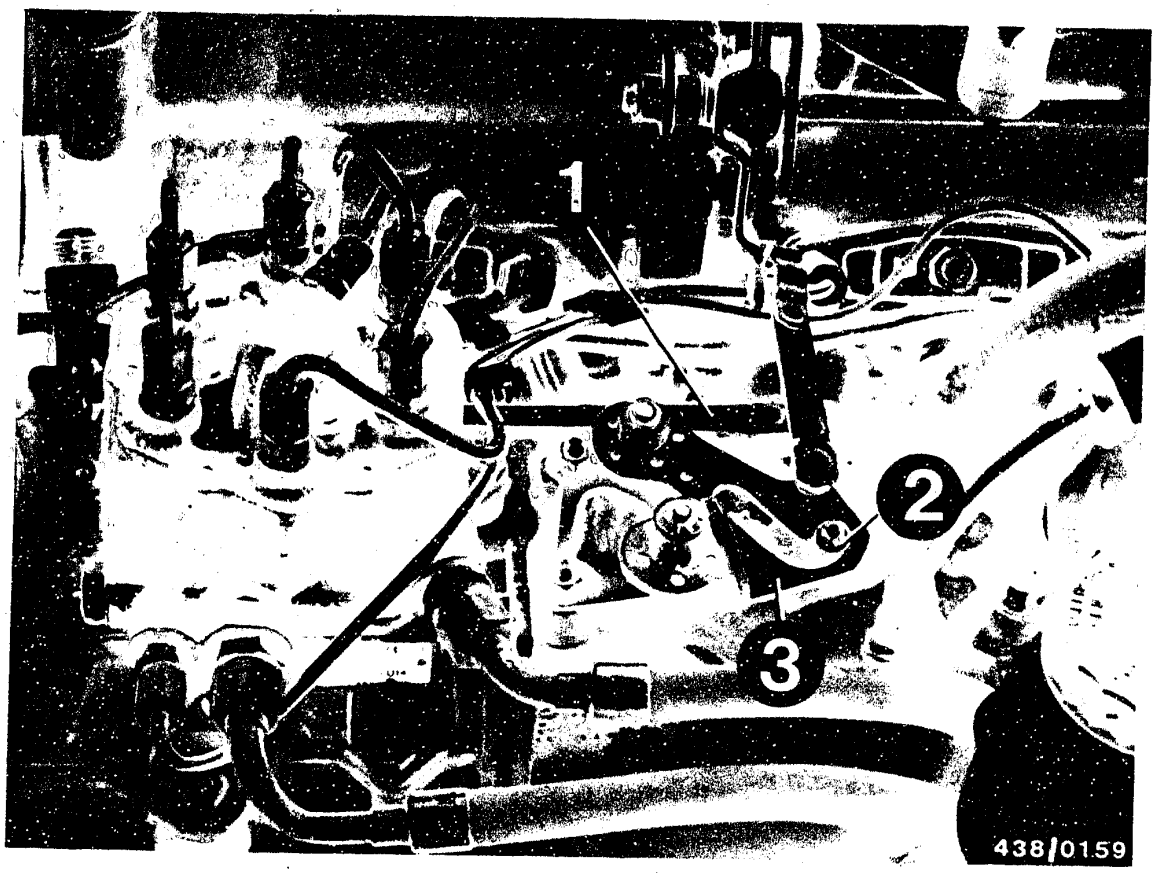
Warm up the engine for adjusting the idle speed (oil temperature approx. 80°C).

Important note:
If the fuel-injection tubing or injection valves were loosened or removed, the engine should be warmed up under load. The low rate of fuel flow during idling is not always adequate to drive all the air out of the fuel-injection tubing.

The idle speed must not be adjusted when the engine is too hot, e.g. immediately after being raced or after a power measurement on the roller-type test stand.

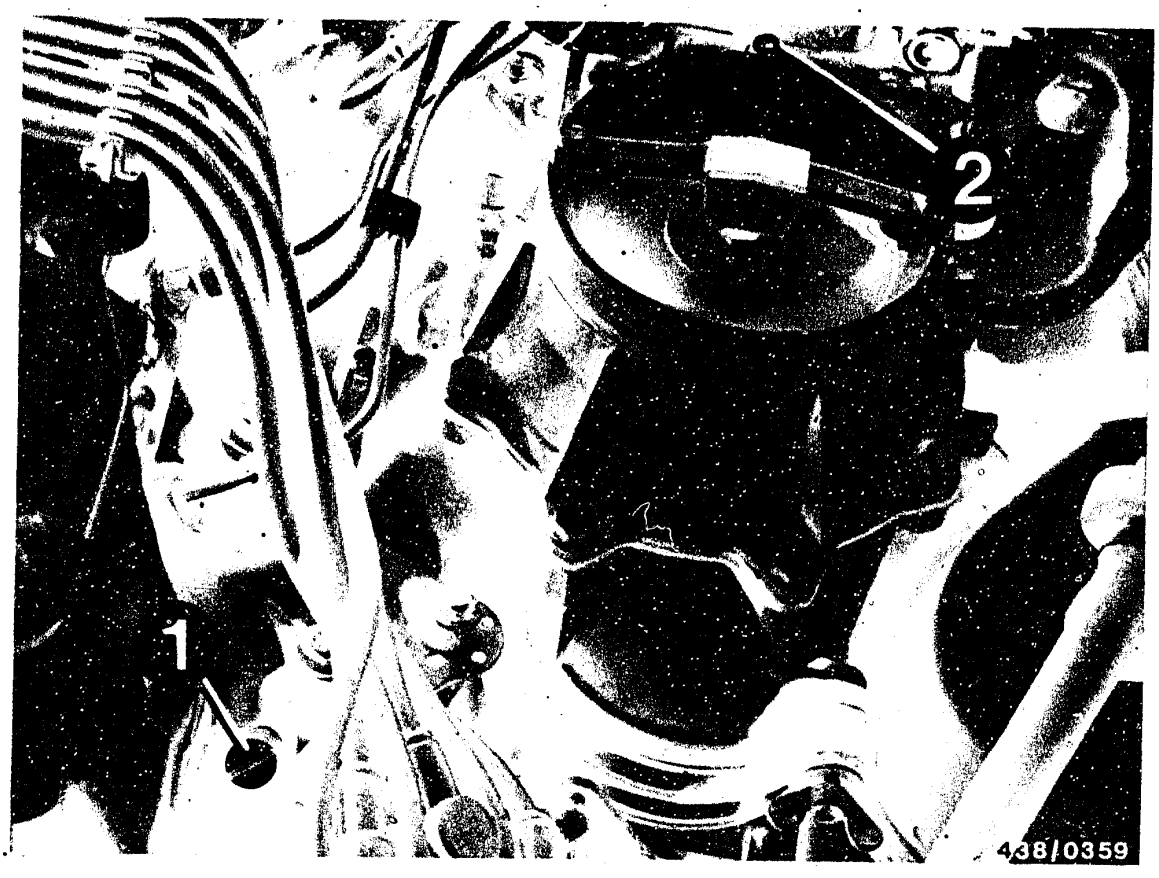
In vehicles with an air conditioner, this should be switched off in order to stabilize the engine speed.

In vehicles with a cruise control check whether the wire cable is up against the regulating lever free of tension. If necessary, adjust the cable with the adjusting nut.



Unhook the link (arrow) from the throttle-valve assembly and check whether the throttle valve is up against the idle stop.
Hook the link back in again in such a manner that it is not under tension.

If necessary, adjust the link (1) so that the roller (2) in the variable-fulcrum lever (3) is up against the end stop.
Roller must not be under tension.



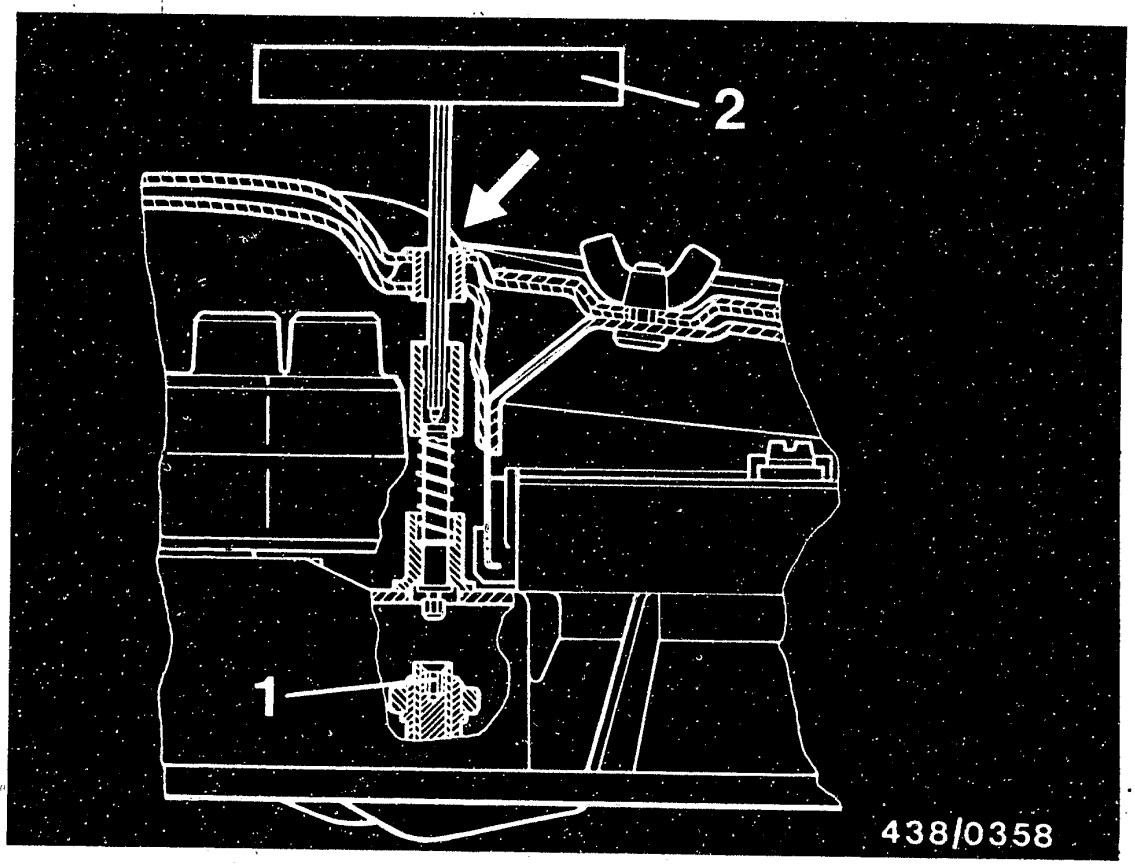
19.2 Adjusting the idle speed and CO concentration

The idle speed is adjusted with the air filter fitted at the bypass screw (1).
The CO concentration is adjusted at the idle-mixture-adjusting screw (2) in the mixture-control unit.

Test specifications - idle-speed adjustment:

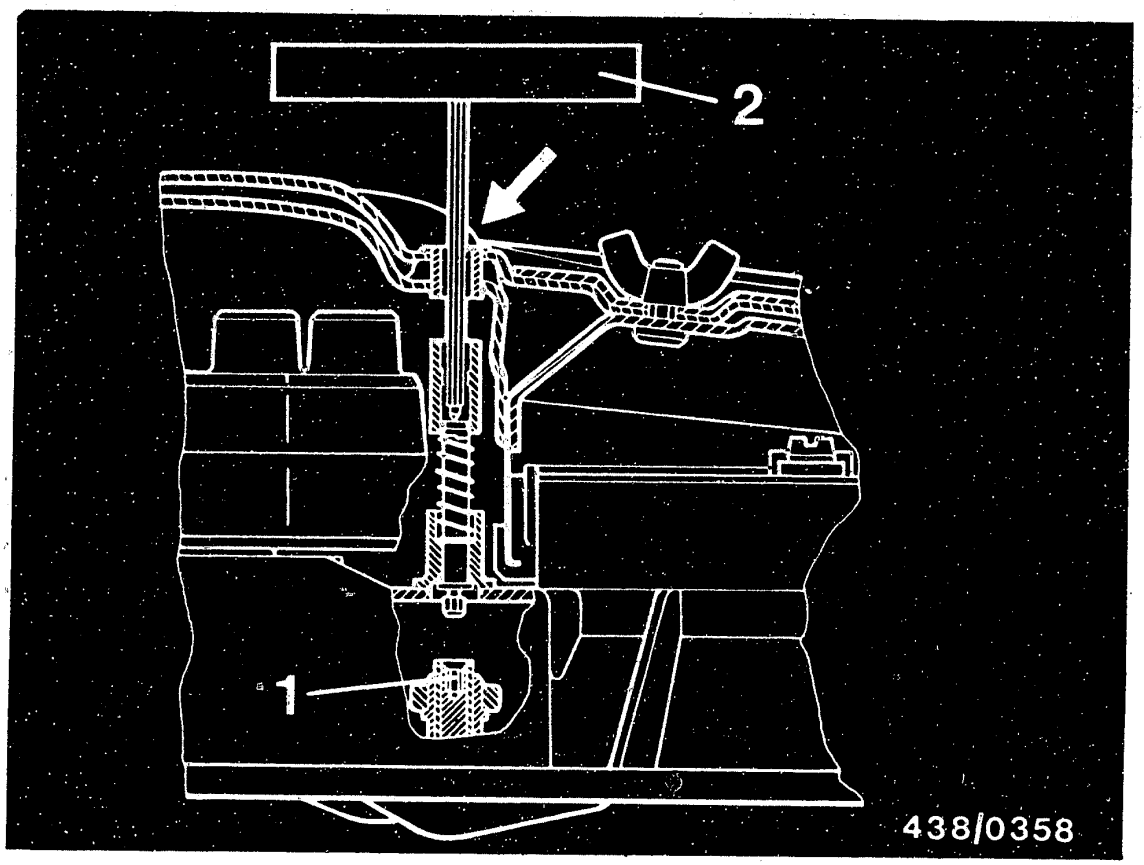
Idle speed: -	750...850 min^{-1}
CO concentration (% by vol.):	0.5...1.5 % by vol.

Select drive mode "D" with the selector lever (automatic transmission), switch on the air conditioner, turn the power-assisted steering to full lock.
The engine must continue running. If necessary, re-adjust the idle speed.



Adjusting the CO concentration

Adjust the CO concentration in the exhaust gas at the idle-mixture-adjusting screw (1) in the mixture-control unit.
The CO concentration is adjusted with the air filter fitted. The adjusting wrench KDEP 1035 (2) is inserted through the specially provided opening in the air filter (arrow).
The idle-mixture-adjusting screw is adjusted via a setting device rigidly fitted on the mixture-control unit with a spring-loaded hexagon-socket key.

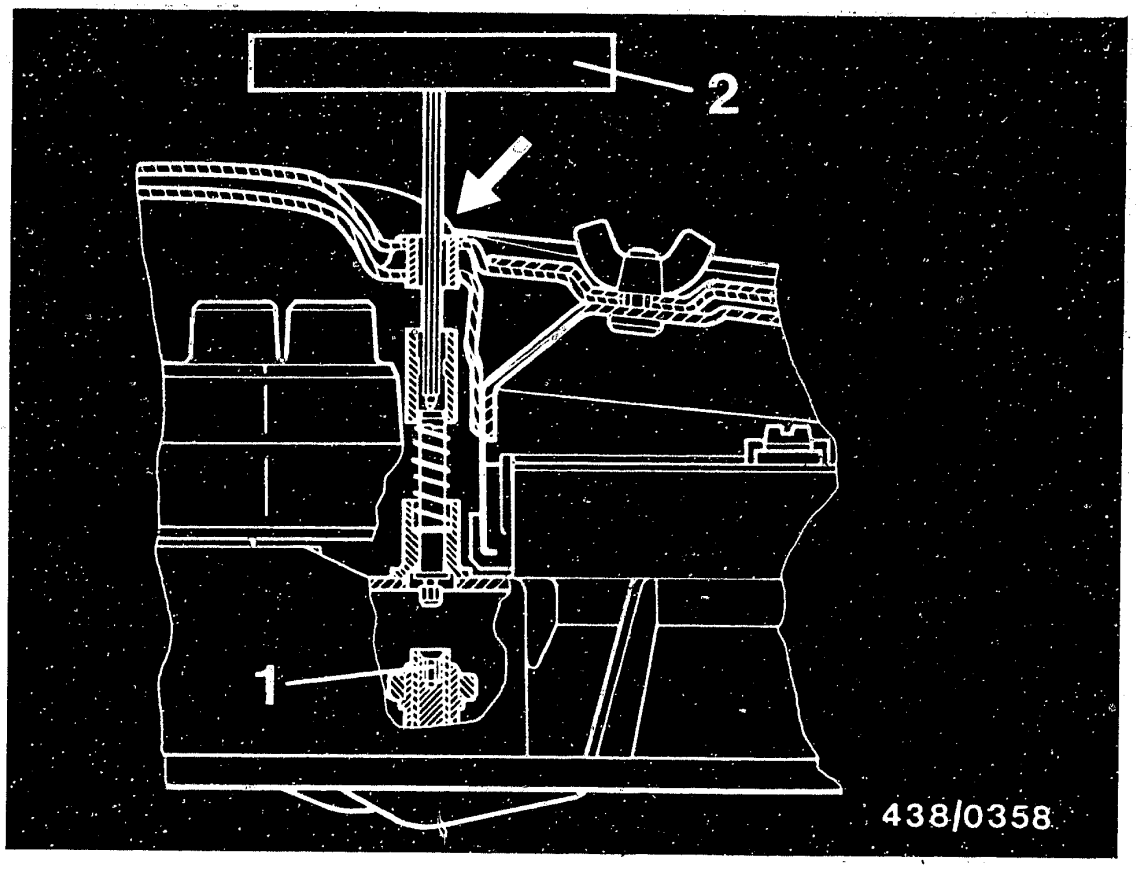


To make the adjustment, carefully press down the hexagon-socket key of the setting device using the adjusting wrench KDEP 1035 until it locks in position in the idle-mixture-adjusting screw.

Remove adjusting wrench after each adjustment.
The hexagon-socket key is forced upwards by the built-in spring and automatically seals off the hole leading to the idle-mixture-adjusting screw by means of an O-ring seal.

Turn clockwise = Richer mixture

Turn counterclockwise = Leaner mixture



Caution:
Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary, and then turn it to the right up to the setting required.
After every adjustment remove the adjusting wrench immediately and accelerate the engine briefly. Do not accelerate the engine with the wrench still in place, because this could result in bending the control lever in the air-flow sensor.

Anti-tamper device for idle-mixture-adjusting screw:
In the Federal Republic of Germany, in accordance with an order for amending the Road Traffic Registration Code, § 47, Exhaust Gases and Their Discharge, has been amended. This order was printed in full in the Vekehrsblatt 13 of 15 July 1975.

Accordingly, all motor vehicles with externally supplied ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissibly influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers fór their own use.

These anti-tamper caps come in different colours. Use the following cap and colour for the after-sales service:
In the downdraft air-flow sensor:
Blue anti-tamper cap (not obtainable from Bosch).
Part No. of Daimler Benz 000.997.5986
Of Deutsche Vergaser Gesellschaft: K 34 520

The bore of the setting device (for receiving the adjusting wrench) is sealed by a plug.
The anti-tamper device is removed and fitted using special tools (e.g. tool set No. 4521/7 from Hazet Co., 5630 Remscheid).

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

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After-sales Service

Technical Bulletin

Securing of idle-speed adjusting screws

K-Jetronic (CIS)

438

VDT-I-438/102 B
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75 .

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor	
Blue	securing cap is not available from BOSCH. Part number is DB 000.997.59 86 from the Deutsche Vergaser Gesellschaft K 34 520
updraft air-flow sensor	
Red	Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

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After-sales Service

Technical Bulletin

SUPPLY PUMPS 0 580 ..

Overview of the non-return valves

Replaceable non-return valves

Part Number	Appropriate seal ring	Fitted in supply pumps
1 583 385 004	1 580 203 002	0 580 254 990, ..991,..998
.. 006	.. 002	.. 985
1 583 386 008	.. 001	.. 987, ..988,..989
.. 011	.. 001	.. 986, ..996
.. 014	.. 001	.. 992
.. 016	1 580 105 001	.. 970, ..971,..972,
		.. 973, ..974,..980

Parts sets (comprising non-return valve complete with seal ring)

1 587 010 001	-	0 580 254 992
1 587 410 901	-	.. 978, ..982 FD823→

Supply pumps fitted with non-replaceable non-return valves

0 580 254 975, ..976, ..977, ..979 and ..982 → FD 822

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung.

After-sales Service

Technical Bulletin

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En
3.1980
Replaces Ed. 2.1980

K-Jetronic

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

complete system (in case of leaks),
injection valves (in case of leaks),
correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5.. .

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely.

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

Vehicles with start valve in intake manifold - with open throttle valve,
Vehicles with start valve in idle duct - with closed throttle valve.

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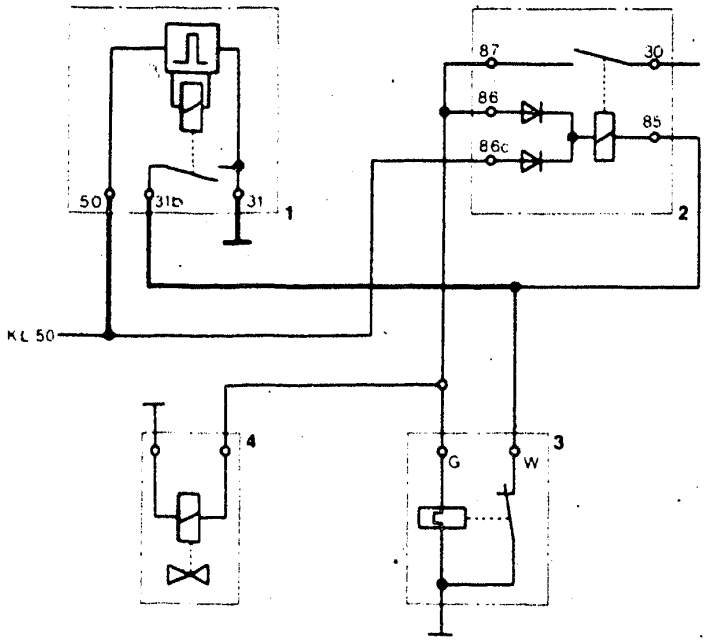
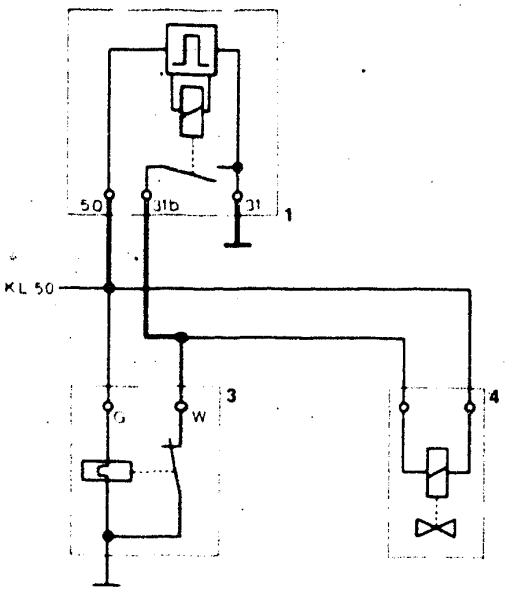


K-Jetronic system with post-injection relay

1 = Timing relay 0 340 000 003
2 = Post-injection relay
3 = Thermo-time switch
4 = Start valve



K-Jetronic system without post-injection relay

After-sales Service

Technical Bulletin

TUBE FITTING WITH FILTER IN WARM-UP REGULATOR 0 438 140 ...

VDT-I-438/106 En
4.1980

Warm-up regulator 0 438 140 065, used in MB 230 E, has a filter in the tube fitting for the fuel inlet to prevent dirt getting in.

When other warm-up regulators with the same connections give trouble or fail because of dirt getting in, then we recommend that you fit the new warm-up regulator with this tube fitting with filter, part no. 1 433 356 802.

During assembly a flat seal ring A 10 x 14 DIN 7603-C-CU, part no. 2 916 710 649, is laid underneath and the tube fitting is tightened with 20...22 Nm (2.0-2.2).

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After-sales Service

Technical Bulletin

FIRMLY FITTED NON-RETURN VALVE

VDT-I-438/107 En

Repairs
fuel pumps 0 580 254 ...

5.1980

Previously fuel pumps with non-exchangeable non-return valve (see VDT-I-438/104 En) had to be exchanged completely in cases of leakage in the non-return valve.

If the fuel pump is in working order and only the non-return valve leaks, there is now the possibility of repairs as part of after-sales service. 2 parts sets have been produced for this purpose, they contain, amongst other things, a tube fitting with built-in non-return valve.

Before using the parts set the installation conditions should be checked. The defective non-return valve can remain in the fuel pump which does not have to be dismantled for fitting the parts set. Before disconnecting the fuel lines the pressure fittings of the fuel pump and the fuel lines should be thoroughly cleaned.

Description and fitting

Parts set 1 587 010 003 for fuel connection with inlet union.

Screw the tube fitting (short side) with the thick flat seal ring into the pressure fitting and tighten. In doing so press against the hexagon of the pressure fitting with a wrench. Place the thin flat seal ring, the fuel-line inlet union and the other flat seal ring on to the long side of the tube fitting and tighten with the hexagon cap nut. Run the engine and check that there are no leaks in the connection.

Parts set 1 587 010 004 for fuel connection with nipple and union nut.

Screw the tube fitting with flat seal ring into the pressure fitting and tighten. In doing so press against the hexagon of the pressure fitting with a wrench. Screw the fuel line to the tube fitting with a union nut and tighten. Run the engine and check that there are no leaks in the connection.

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Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

Table of contents

Section

Table of contents (continued)